Supplementary file S1. May, 2019. Draft report (9 pages) & unstructured background information data dumps. [Quoted texts & graphics are included under "fair use" terms for scientific review/critique and do not intend to contravene any copyrights to original authors and is presented without prejudice].

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Soil Organic Carbon to Fix Climate, Crops and Cancer [Draft]

By R.J. Blakemore PhD (VermEcology); datestamp – 29th March, 2019).

Abstract

Climate change attributed to human activities correlates with a measured excess of CO_2. Yet, from NASA/IPCC data, a shutdown of non-essential business for just six days would enable land plants to entirely fix annual CO_2 excess of 4 Gt C. Remedial rebuilding of soil organic carbon (SOC) in worm-worked humus at 2–5 Gt C/yr is then the only practical carbon capture and storage (CCS) capable of freely offsetting anthropogenic emissions. A case is made to redirect all available resources towards proven, earthworm-based, organic husbandry as a priority to safely combat mounting global threats due to irreversible species extinction, perilous climate change and deteriorating human wellbeing (mental/physical health). Underpinning all three interlinked risks is a relentless, yet largely ignored, critical loss of precious topsoil at 2,000 t/s (1 Gt/yr C). First step to recovery is vermi-composting of all 'wastes' back to the field under Howard's "Law of Return".

Introduction

Climate change is mainly due to accumulation of excess carbon in the atmosphere currently at a rate of +4 Gt C per year (+2 ppm CO_2). This is not an economic, chemical, geo-physical nor an engineering problem, rather it is an ecological imbalance attributed to land clearance combined with rate of fossil fuels emissions exceeding the living Earth's ability to process CO_2. The UN's latest bulletin (IPCC 2018 https://www.ipcc.ch/sr15/) predicts a brief window of just 12 years – to 2030 – in which the perils of climate change must be tackled. Temporary, shutdown may provide initial respite as partially imposed in the USA in 2018/2019 (Figure 1).

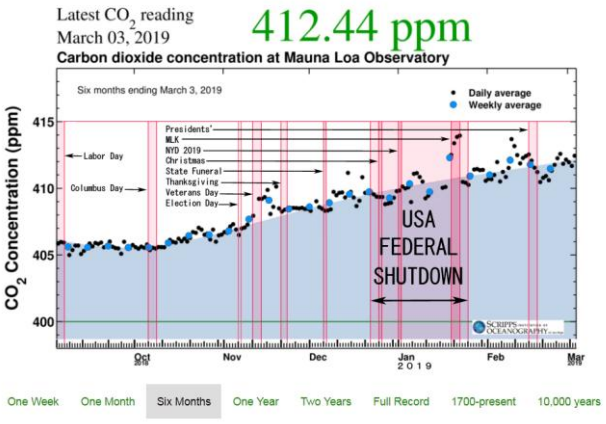


Figure 1. CO_2 on Hawaii with US holidays and shutdown of 800,000 staff; notwithstanding seasonal, local weather, time lag or other compounding factors, there may be correlation links.

Climate is not the greatest threat, however, as both a loss of species diversity (due largely to intensive chemical agricultural crops) and excess synthetic fertilizers were both flagged as more urgent by Rockstrom *et al*. (2009). Yet all of their nine pillars of survival rely entirely upon topsoil that, based upon UN's FAO data, provides 99.7% of human food (just 0.3% from fisheries) whilst also being increasingly lost at a rate of 2,000 tonnes per second globally (Pimental & Burgess; Blakemore 2018b). Remedies are suggested by the Drawdown project (https://www.drawdown.org/), about 85 of their top 100 suggestions being some of the adaptable Permaculture principles and practices (Mollison 1988).

Critical and rapid loss of invertebrate (insect and earthworm) and collapse of other organism food-web diversity by -80–100% is attributed to agrichemical intensification (German study and Blakemore 2019a) or to climate warming (https://www.pnas.org/content/115/44/E10397).

Toxic agrichemicals are also known to cause cancer and neurological or reproductive problems in test rodents and in humans (Seralini 2014, 2015, 2018 the two studies from 2019). Children and farm workers are particularly susceptible to herbicides with induced Parkinson's and autism rates high, the latter is currently reported as 1 in 10 but projected to be 1 in two without radical change in soil and food health (Swanson & Leu). Cancer in USA is also currently 1 in 2 (Seneff and my blog) such that soon no one will be unaffected. These findings indicate that, rather than being caused by genetic disposition, both conditions are environmental.

Surprisingly, all three of these problems (climate, biodiversity and health) are interlinked and solvable by the simple expedient of the restoration of organic farming. as was indeed advocated by Howard (1945) and Balfour (1977) at the time agricultural intensification multiplied and spread following WW2. The mantra that chemical agriculture is required to "feed the world" and we must provide "80% more food by 2035" is de-mythified by FAO data showing 70–80% of sustenance already comes from small family farms not from extensive and expensive grain monoculture and that a population increase of just 20% requires just 20% more food (my blog). Organic farming preserves or restores biodiversity and food variety, conserves soil organic matter and essential soil moisture whilst also saving costs plus providing greater employment without overall loss of production (Blakemore 2018a).

Critical organic carbon loss (humus) from soils in recorded history has been exceptional, and the idea that atmospheric carbon increase may be related to loss of soil carbon is not new: a paper by Revelle & Suess (1957) that proposed it as one possible cause of the Callendar's effect. A global carbon debt due to agriculture is of 133 Gt C for the top 2 m of soil, with the rate of loss increasing dramatically in the past 200 years (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5594668/). Kohl et al. (2015 - https://www.sciencedirect.com/science/article/pii/S037811271500314X) show the largest loss of carbon estimated at about 5 Gt C from 1990-2015 from forest soils. Blakemore (2018a) plots carbon lost from non-organic fields in the last 175 years. Australia has been particularly

affected with decreases in soil organic carbon (SOC) stocks on the order of 40 to 60% from pre-clearing levels (CSIRO report https://www.mla.com.au/globalassets/mla-corporate/blocks/research-and-development/csiro-soil-c-review.pdf). Yet it was only in 2015 that the international 4 per 1,000 initiative was proposed (4p1000.org). It's aim: to increase soil carbon by 0.4% that, due to upped terrain, now requires just 0.1% with their starting 1,500 Gt SOC is now raised to >8,500 Gt (Blakemore 2018a). But "4 per 1,000" remains a worthy goal if it is redirected to ensure an earthworm population of at least 4 worms per 1,000 cc or per spadefull of topsoil. Conserving a living and vibrant topsoil is an implicit aim of organic farming/Permaculture and possible global carbon offset was as indeed provided for by Blakemore (2015a, b).

The current paper further investigates how organic farming can safely redress the three main issues. Problems of lack of meaningful and reliable science will be briefly discussed in relation to space, ocean and deep carbon research and to the lack of a single Soil Ecology Institute.

Methods

Published reports based upon NASA, NOAA, 4p1000 and UN's IPCC data is reviewed and revised for newly calibrated land surface areas (Blakemore 2018b). The photosynthesis formula $6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6O_2$ is reversed by respiration and decomposition, both a form of slow combustion. Decomposition is mainly by earthworms and microbes and always uses oxygen and a hydrocarbon to produce CO_2 and H_2O. Respiration chemical formula is $C_6H_{12}O_6 + 6O_2 = 6CO_2 + 6H_2O$ (glucose carbohydrate + oxygen → carbon dioxide + water). Photosynthesis operates within temperature constraints and requires chlorophyll. Production is mainly terrestrial by autotrophic vascular plants plus the cryptogamic mosses or lichens and microbial biocrust (as discussed in appended data file). Totals are measured as carbon rather than CO_2 and are presented in Gt yr^{-1}.

Results and Discussion

Shutdown

The possibility of emission offset is exactly provided by NASA (2011) and by IPCC (2013: fig. 6.1) data with gross terrestrial photosynthesis of 123 Gt C and +4 Gt C added to the atmosphere annually; thus 123/365 = 0.33 Gt C/day biofixed so just 12 days natural land production exactly accounts for the excess (viz. 0.33 Gt C/day x 12 days = 4 Gt C). When terrain allowance (Blakemore 2018b: tab. 11) doubles photosynthesis up to at least 218 Gt C/yr, but plausibly to >250 Gt C/yr, then this rate is newly reduced by about half. Therefore just 6 days respite would be required. The implication is for a synchronized, temporary shutdown of global business and transport, perhaps for 3 days at each equinox or for one week around Rachel Carson's birthday in May each year when it peaks, in order to entirely offset annual excess CO_2 accumulation.

Both NASA (Figure 2) and IPCC (Figure 3) have a variable net terrestrial sink of ~3 Gt/yr and a relatively minor passive ocean sink of just ~1.7 Gt per annum. However, NASA separates land respiration and decomposition as 60 Gt each (= 120 Gt), whereas IPCC has "*Total respiration*

and fire" of 118.7 Gt C (discrepancy 120-118.7 = 2.3). This total and the inclusion of fire is questioned and further discussed below. Note that net ocean production is shown by both NASA and IPCC to be negligible from a passive ocean-atmosphere (or air-sea) gas exchange; marine photosynthesis is for soluble CO_2 and is greatly limited by photons and nutrients. Indeed, IPCC only shows 3 Gt total marine biota, as also revised by Blakemore (2018b), so oceans are hereafter largely irrelevant for further practical carbon consideration.

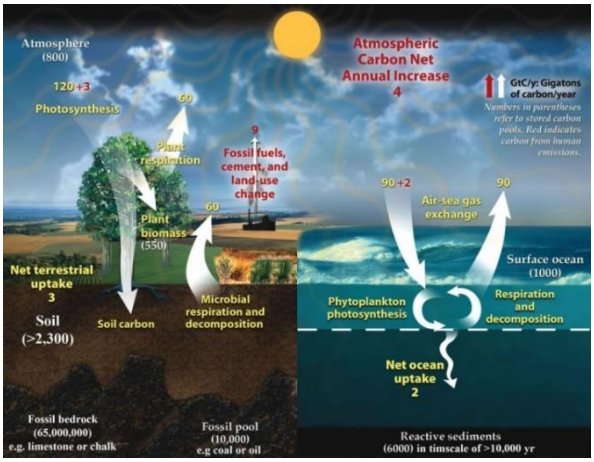


Figure 2. NASA (2011) graphical summary (Blakemore 2018b: fig. 10); appearing to exchange 90 Gt C/yr, oceans are actually in air-sea equilibrium passively absorbing about 2 Gt C/yr.

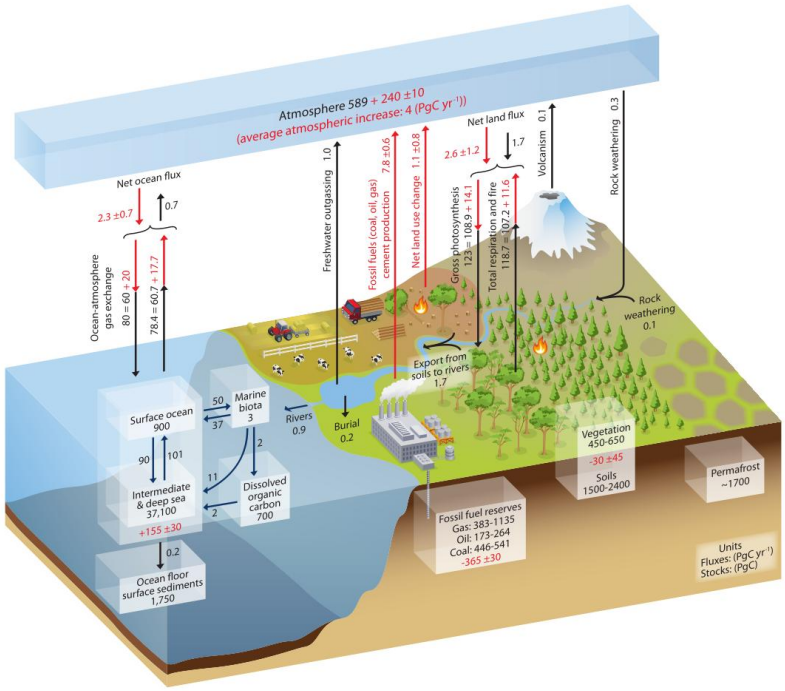


Figure 6.1 | Simplified schematic of the global carbon cycle. Numbers represent reservoir mass, also called 'carbon stocks' in PgC (1 PgC = 10^{15} gC) and annual carbon exchange

Figure 3. IPCC (2013: fig. 6.1 https://www.ipcc.ch/report/ar5/wg1/) Global carbon cycle with land sink of between 1.4–3.8 Gt C/yr; this needs to be increased by proper organic farming.

NASA or IPCC's data have annual anthropogenic addition from fossil fuels, cement and land use change of 9 Gy/yr with 4 Gt stored in the atmosphere and <2 Gt taken up passively by ocean gas exchange, giving a reasonable land balance of >3 Gt/yr C soil sink in humic SOM. Human contributions of 9 Gt C/yr (<4%) compare to a natural flux on land of at least 218 Gt C/yr (>96%) (Blakemore 2018b: tab. 11) indicating a deficit of photosynthesis on land. Moreover, the entire 800 Gt of atmospheric carbon is recycled via (ca. 60 Gt C) leaf litter through the intestines of earthworms and by microbial decomposition on average in ~12 year cycles (Blakemore 2018b). When terrain is considered, annual leaf-litter is approximately doubled (>120 Gt C) thus the atmospheric carbon cycle rate is then halved (800/120) to ~6.66 years to process all global CO_2. Consideration of below ground microbial decomposition may further reduce this rate by yet again by half. Further estimations are required.

Carbon Sequestration in Humus of Organic Farms also Sustains Food Supply

Agriculture uses fully 50% of habitable land with a quarter of this area cultivated for crops that supply 83% of human food, the rest being pasture with meat and dairy providing 17% of calories (<1% food is from the ocean); forests (37%), marginal scrub (11%) and cities (2%) occupy the remaining surface area of habitable land (Our world and Blakemore 2019b: fig. 4).

Farmers are often coerced from soil stewards into toxic chemical accomplices. When trees are cleared, pastures ploughed, or plants and soils sprayed with biocides then the vital soil biota – microbes, fungi and earthworms – are destroyed and topsoil humus depleted requiring yet more synthetic chemicals. Soils that are poisoned, rivers running brown with silt and the air filling with dust from the exposed ground are key indicators. These first steps to desertification are exacerbated by last-resort herded grazing of cattle, sheep and goats before abandonment.

Food security is partly due to political inadequacies and partly due to waste, but the true situation is 70–80% of global food is provided not by industrial agriculture but by local small-holders and gardeners; so industrialized food provides only about 30% of the total (https://web.archive.org/web/20180723183644/https://ag-transition.org/1769/who-produce-our-food/ ; http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/Factsheet_SMALLHOLDERS.pdf ; http://www.fao.org/3/a-i4036e.pdf. Family farms constitute over 98% of all farms and manage 53% of agricultural land meeting 36–114% of domestic caloric requirements (https://www.sciencedirect.com/science/article/pii/S0305750X15001217). There are some 500 million smallholder farms worldwide; more than 2 billion people depend on these for their livelihoods. These small farms produce about 80 per cent of the food consumed in Asia and sub-Saharan Africa where population growths are highest (https://www.ifad.org/documents/10180/ca86ab2d-74f0-42a5-b4b6-5e476d321619). It is estimated that farms under 2 ha globally produce 28-31% of total crop production and 30-34% of food supply on 24% of gross agricultural area (https://www.researchgate.net/publication/325405959_How_much_of_the_world's_food_do_smallholders_produce). For example, UK allotments are 10 times more productive than chemical agriculture (https://ourworld.unu.edu/en/home-growing-produces-ten-times-the-

food-of-arable-farms). Claims of 80% more food needed by 2050 are also debunked (Blakemore 2019b appendix https://www.mdpi.com/2571-8789/2/4/64).

Permaculture (Mollison 1988), with appropriate ecological production (organic agroecology), defrays accumulation of toxic, persistent and harmful agrichemicals/pharmaceuticals whilst rebuilding healthy soils without jeopardizing food security. Harmful synthetic N-P-K from fertilizers are replaced with microbial mineralization via vermicomposting of all organic 'wastes'. Due to doubling of land surface area and also of topsoil relief, the natural nitrogen fixation of microbes in the soil may be similarly doubled or quadrupled over Smil's (2010) data.

Applying synthetic N fertilizers actually depletes soil C as was noted by Howard (1943) who said: "*The use of artificial manure, particularly [synthetic nitrogen] … does untold harm. The presence of additional combined nitrogen in an easily assimilable form stimulates the growth of fungi and other organisms which, in the search for organic matter needed for energy and for building up microbial tissue, use up first the reserve of soil humus and then the more resistant organic matter which cements soil particles*." This was confirmed in several recent articles from 2007 (https://grist.org/article/2010-02-23-new-research-synthetic-nitrogen-destroys-soil-carbon-undermines/ ; https://www.sourcewatch.org/index.php/Synthetic_Fertilizer ; https://www.farmprogress.com/soil-health/nitrogen-fertilizer-reduces-soil-organic-matter ; https://www.growjourney.com/5-facts-synthetic-nitrogen-fertilizer/).

Even with emissions reduction, the imperative is to remove excess carbon from the air. The only way to achieve this is via photosynthesis on land with storage in worm-worked humus. In order to process and store more carbon on land the requirement (from the photosynthesis equation above) is to increase scope and scale. This simply requires keeping soil covered with green plants for more of the year plus recycling of all organic wastes that are currently burned or buried. The best way to increase photosynthesis is to reduce deforestation and desertification or to increase reforestation. At the same time, all managed surfaces should be re-greened (e.g. cover crops and "green curtains"). Organic production seems to provide higher plant yields compared to chemical farming with many other advantages in terms of carbon sequestration in humic topsoil, higher soil moisture and microbes (Blakemore 2015a, b).

Based upon just 1,500-2500 GtC SOC, a change by 4p1000 of just 0.4 % yr−1 would equate to a flux of up to 10 GtC yr−1 from the atmosphere (Minasny et al., 2017). But new SOC data of at least 8,500 Gt C means a change by just 0.4% yr-1 would be a flux of at least 34 Gt C per year which would exceed excess CO_2 emission by three times, or completely offset emissions whilst simultaneously reducing excess atmospheric CO_2 to the desired levels within a few years. Additional benefits are in terms of biodiversity and for plant, animal and human health. (Cf. Zomer et al. 2017).

Human Health and Biodiversity

The problems of the chemical agricultural system in critical species extinction, although topical, are not new and were reported from the earliest field experiments at Rothamsted almost 100

years ago (Morris 1922, 1927). He found insects and soil invertebrates depleted by -88% and earthworms almost completely eradicated at -99% by synthetic chemical fertilizers (Blakemore 2018a: tab. 1; fig. 6). It is not just the invertebrates affected; birds and mammals including humans were also impacted (Carson 1963). Cancer rates from Carson were 1 in 4, now >1 in 2 and US cancer society says 95% are environmental. Many farm chemicals are now banned as being carcinogenic or environmental POPs. Reduction of the ozone layer is another chemical problem exacerbating skin cancers that the banning of CFCs has helped to reduce.

Burning Issue

Achieving this extra 0.4% SOC, eschews all un-necessary burning of crop residues or timber. FAO AFOLU (2014: 3 http://www.fao.org/docrep/019/i3671e/i3671e.pdf) says the land use factor accounted for a third of total anthropogenic greenhouse gas forcing. Natural forest, savannah and peat fires with deliberate or prescribed burning in Australia, rice husk in Asia and sugarcane trash burning contribute to this. Forests may take 80 years to recover (https://theconversation.com/forest-soil-needs-decades-or-centuries-to-recover-from-fires-and-logging-110171) thus tree planting does not match the carbon solution it is claimed to be.

In general, actual CO_2 released by burning vegetation (about 1.9 kg per kg burnt due to O_2 oxidation) is not included because, IPCC considers it balanced by carbon taken up during plant growth, so the emissions are "carbon-neutral". If so, this is mistaken in my view as all plants can be mulched or composted and carbon returned to the soil rather than go up as smoke into the atmosphere. Perhaps this humic SOC aspect is an important yet overlooked consideration.

3.5. Science shortcomings

Science needs to be directed to solve problems that are meaningful and important for humanity. Since 1958, and for more than 60 years, Mauna Loa's carbon increase has been undeniably observed to increase. Yet no potent solution has been provided. Perhaps the simple shutdown suggestion in this paper will promote a doable action (or rather inaction!) to achieve balance within IPCC's remaining ten year timeframe while also satisfying the needs of all except for the ill-informed or overly indulgent few who will equally suffer the adverse effects of climate change and extinctions. Science has often failed to honestly provide solutions to such pressing problems (Horton 2015 https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736%2815%2960696-1.pdf) but it is, as yet, is the best and only rational way to appreciate Ecology's complexity. See also later section on "**Science turns to Darkness**".

The chart below shows how – despite what ocean or forestry advocates claim – the overwhelming global bulk of soil carbon is stored below ground in soil humus: mainly in its living, dormant and deceased microbes (source UN's FAO from IPCC 2000) (Figure 7).

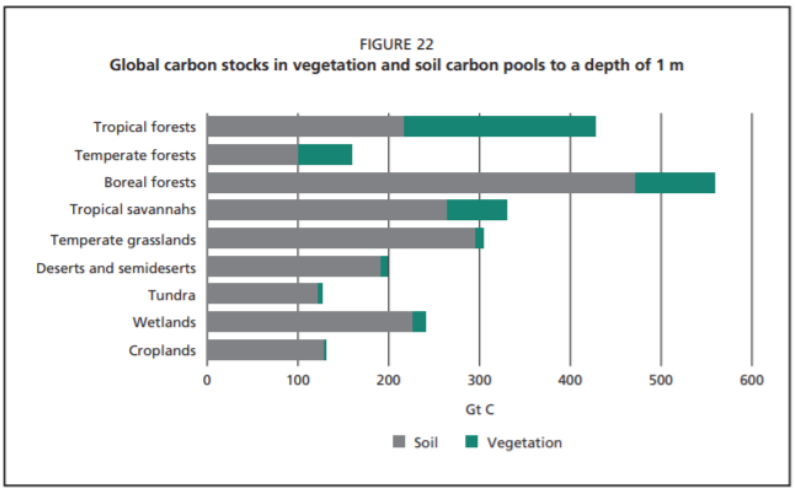


Figure 7. Globals carbon stocks in above ground and below ground biomass (from IPCC 2000).

This figure from FAO http://www.fao.org/3/a-i5857e.pdf shows, firstly, that forests are not the solution rather that soils are and, secondly, even forest soils only store less than half soil C, about 39%. Forests too can burn rapidly releasing their stored carbon. Revised terrain and topography values likely more than doubled these all these values, raising the soil carbon they estimate as 2,000 Gt to >4,000 Gt or as estimated by Blakemore (2018) as 8,580 Gt global soil carbon (with ~3,400 Gt from permafrosts?). Nevertheless, extensive landscape destruction as for southern Brazil's forests and savannah being cleared for GMO/glyphosate soy monoculture mainly to export for western-style CAFO meat production seem unjustifiable.

It is ecologically impractical to squander the fossil fuel resource needlessly, especially when there are viable alternatives such as solar-passive design and unlimited geothermal or hydroelectric energy. Penalties of not rationing the fossil fuel resource will affect all lives detrimentally but, at the same time, it is pointless to protest without some reasonable alternative. This study suggests a brief series of shutdowns to restore balance and to allow natural processes to prevail. At the same time, the reality is that the topsoil resource is more valuable and more limited than most others and an urgent priority is to preserve and restore this immediately. Permaculture and organic farming restoration are the least harmful and most hopeful options.

All these issues suggest that government subsidies for chemical farming be removed and a moratorium put on irrelevant and non-essential deep space or ocean research until such a time as urgent topsoil loss is stabilized. Such savings can be redirected for agroecological research and towards the two or three years organic conversion period that was highlighted by the 100% conversion in several Indian states, for recovery of depleted soil and for the extra employment opportunities. Chemical farming does not feed the world and healthy people do not need drugs. From UN data 70-80% of food is supplied by small farms rather than industrial chemical ventures and, rather obviously, it is soil ecology that provides food and healthy food that provides health.

UN Environment: "These Safeguard Standards mainly reflect a "*do no harm*" commitment, but as the implementation of the Framework evolves, they will be expanded into a comprehensive "*do good*" commitment in line with intention of the UN Environment to promote environmental, social and economic sustainability in what the organization does. UN Environment projects and their related Safeguard documents...".

Conclusions and Summary

A planned annual shutdown for one week, according to official figures (NASA/IPCC) would offset annual CO_2 accumulation and allow natural processes to progress as aided by planned programmes such as the 4p1000 initiative for organic farming. The official view, however, is that Natural Climate Solutions (NCS) can provide over one third of cost-effective climate mitigation alongside aggressive fossil fuel emission reductions (https://www.pnas.org/content/114/44/11645.full), this study based upon IPCC (2014 - IPCC Working Group III (WGIII) cf. Zomer et al. (2017). Yet the subsequent, 4p1000 (4p1000.org) plan provides an feasible method. Albeit this was disputed by Batjes (2018), his study did not include the upwardly revised SOC totals (>8,500 Gt C) from Blakemore (2018b) that were accepted by Lal (201). An unresolved issue is the contribution of the permafrost factor that was included in this revised total SOC of permafrost carbon that was estimated by IPCC to amount to 1,700 total (see Figure above) which may however be doubled due to terrain to 3,400 representing 25–50% of total SOC. Regardless, the imperative is to remove toxic agrichemicals from the environment as an urgent priority in order to reduce climate change, to conserve biodiversity and to protect human and animal well-being. The the only practical alternative is organic production with implicated and interlinked issues of energy, housing and transport requiring separate study.

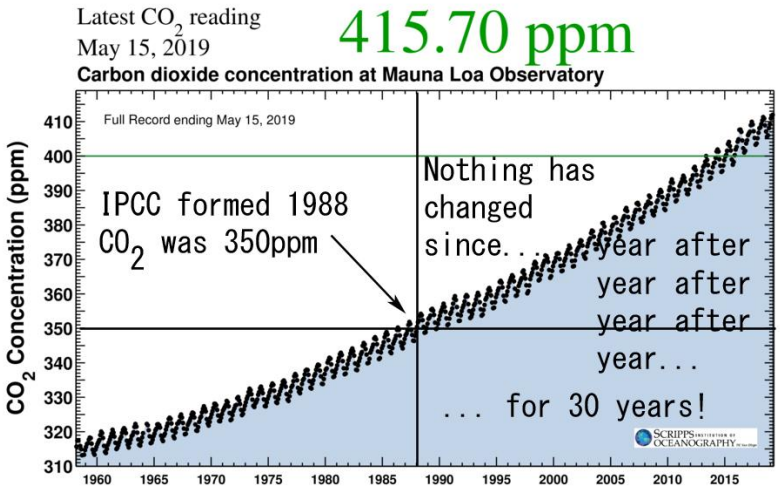
An appended file will provide background information on C isotopes, the deep carbon project compared to details of biocrust photosynthesis, total carbon storage potential and other data.

[End of first unchecked draft March, 2019]

Appended or source data follow, much intended for inclusion but rejected due to page limits.

Appended data and sources

The urgency of the environmental disaster requires TRIAGE as in a medical disaster. Our house **is** on fire, sometimes literally, and while NASA says let's go stargazing, or NOAA says we must save the goldfish(!!), normal people realize that we need to put the fire out and to fix the problem quickly. The analogy is especially relevant because with a house fire **we do not need a committee** to deliberate... (e.g. slow IPCC !!).



This chart is same as with EPA and Biocide usage (above in paper). Same failure to act.

Interestingly, 1988 when IPCC formed was also publication date of Bill Mollison's Permaculture Design Manual. Regarding climate change and GHGs he says pg. 555-556: "*Padi rice and feed-lot beef will be disallowed or eliminated as major pollutants, and supplemented with less polluting alternatives (e.g. potatoes, free range beef ,chicken flocks)*." And (pg. 557): "***The profound change we must all make is internal; everybody needs to realise that there is no group coming to their rescue, that it is only what each of us does that counts; thus, those who cooperate with others and take on a task relevant to all people, will be valued above those who seek personal survival.***"

Bill Mollison also said in interview: "The ultimate end to a growth economy (we are all sold on that) is the same as an analogous growth, cancer. But for national economies, the victims are nature, soils, forests, people, water, quality of life. **There is one, and only one solution, and we have almost no time to try it. We must turn all our resources to repairing the natural world, and train all our young people to help. They want to; we need to give them this last chance to create forests, soils, clean waters, clean energies, secure communities, stable regions, and to know how to do it from hands-on experience.**"

Permaculture offers practical solutions as the DPC course teaches teachers and is applicable to every climate and bioregion. Thus it can rapidly taken up to meet challenges with flexible and sustainable responses. It is also worth noting that allotments or smaller scale garden farms supply 10 x more food per unit area than broadacre crops do. Reference; Kier Watson (2015 https://ourworld.unu.edu/en/home-growing-produces-ten-times-the-food-of-arable-farms) "'Who feeds the world? My answer is very different to that given by most people. It is women and small farmers working with biodiversity who are the primary food providers in the Third World, and contrary to the dominant assumption, their biodiversity based small

farms are **more productive than industrial monocultures**." [my emphasis] Not only are such small holdings more productive, but they provide a greater diversity of food, with a better range of nutrients, vitamins and minerals than do most commercial farms." They also store x2 soil organic carbon...

"You seriously want to save the planet? Give us the tools, and the land, and we – (Permaculture) gardeners – will do it for you." - www.telegraph.co.uk/gardening/howtogrow/10792603/Soil-report-shows-we-should-all-grow-more-of-our-own.html .
IFAD: There are some 500 million smallholder farms worldwide; more than 2 billion people depend on them for their livelihoods. These small farms produce about 80 per cent of the food consumed in Asia and sub-Saharan Africa.

https://www.ifad.org/documents/10180/ca86ab2d-74f0-42a5-b4b6-5e476d321619

We estimate that farms under 2ha globally produce 28-31% of total crop production and 30-34% of food supply on 24% of gross agricultural area. https://www.researchgate.net/publication/325405959_How_much_of_the_world's_food_do_smallholders_produce

Regarding charcoal/biochar; it has very limited application and its production also produces CO2 and carbon monoxide plus other toxic tars. It **offers no advantages** over tried and proven (vermi-)composing. The limited use may be e.g. for biosolid sewage sludge.

The complexities of global carbon cycles are revisited and simplified to their core ecological issues. The present, steady increase in atmospheric CO2 is incontrovertible and its cause as due to anthrogenic activity is compelling. The question is why it is not reabsorbed by photosynthesis? This paper attempts to address this with practical and plausible solutions, in particular the need for temporary global "shutdowns" and for a rapid restoration of organic farming practices. The available and conservative figures show, surprisingly, that annual burden of excess carbon in the air can be offset entirely by a six day hiatus of fossil fuel combustion to achieve a steady state. Actual removal of the excess carbon is entirely possible by two simple expedients of increasing scope and capacity of photosynthesis by keeping surfaces vegetated and by the recycling all organic food wastes via composts in order to restore soil humus. These natural and harmless policies would achieve restoration of carbon balance, help restore biodiversity and reverse the critical decline of species, and whilst removing much of the toxic agrichemical pollution would improve human and animal health by the provision of more wholesome and nutritious foods and the provision of meaningful employment thus reducing crippling social and medial or psycological health issues.

UN's IPCC has a window of opportunity to remedy climatic issues within just ten to 12 years. Required are sound economic and scientific methodologies. Science is universal, inclusive, transparent and ideally fact-based without any nationalistic or regional politics. To be useful to society it must solve real problems. When politics intervenes it is important to realize that politics is subordinate to society, society is subordinate to economy and, most critically, that economy is subordinate to ecology. Simply put: no ecology → no economy. Talk of economic growth is meaningless if the real expense is ecological since ecological growth, which is terrestrial net primary productivity at about 89% of total (just 11% from oceans), is finite at

about (488 – 52 =) 436 Gt C per year (Blakemore 2018). That said, there need to be an environmental triage of which issues are most important and require most urgent treatment. Rockstrom is good start. However, they all miss the crucial underlying foundation of global ecology which is the topsoil. This is the most pressing issue.

Subsidies for chemical farming must be removed and a moratorium put on irrelevant, deep space or ocean research until such a time as urgent topsoil loss is stabilized. These savings can be redirected for agroecological research and towards the two or three years conversion period and recovery required for depleted soil and for the extra employment opportunities. Chemical farming does not feed the world and healthy people do not need drugs. From UN data 70-80% of food is supplied by small farms rather than industrial chemical ventures and, rather obviously, it is soil ecology that provides food and healthy food that provides health.

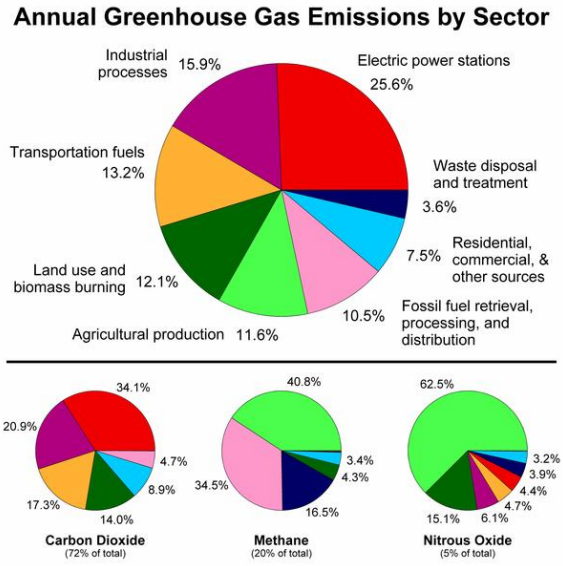
UN Environment: "These Safeguard Standards mainly reflect a "***do no harm***" commitment, but as the implementation of the Framework evolves, they will be expanded into a comprehensive "***do good***" commitment in line with intention of the UN Environment to promote environmental, social and economic sustainability in what the organization does. UN Environment projects and their related Safeguard documents..."

Food security is partly due to political inadequacies and partly waste, but the true situation is 70–80% of global food is provided not by industrial ag but by local small-holders and gardeners, and industrial food production produce only about 30% of the total global food production (https://ag-transition.org/1769/who-produce-our-food/ ; http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/Factsheet_SMALLHOLDERS.pdf ; http://www.fao.org/3/a-i4036e.pdf , i.e., we do not rely on chemical ag! As to national food securities, in UK an allotment is more than ten times as productive per unit area than a farmed field (Ref below). Indeed allotments were part of the "Victory Gardens" implemented during WW1 and WW2 with the food waste issued being recognized as early as 1915, over 100 years ago. Cuba is an example of non-agrichemical and sustaibable self-reliance achievable in short time.

So you can drive your car and fly (but will probably have to pay premiums for this luxury) but you will need to eat less meat (having vegetarian meals as standard and meat as an optional extra) and you will need to remove your waste-disposal unit, your bonfire and your bin then start to compost all your organic wastes The question of manures is to be determined.

Erosion of humus is a main reason why carbon is accumulating in the atmosphere. As well as burning fossil fuels, the human contribution to increasing atmospheric carbon is due to removal of vegetation and to failure to recycle all organic matter back onto agricultural fields. A misperception is that only the of burning fossil causes excess CO2, the missing part of the equation is the reduced recycling via photosynthesis and lack of storage of carbon in soil humus. New calculations show all atmospheric carbon can be recycled in as short a period as three years and that soil organic matter (SOM), or humus, is the major global storage of active

carbon at greater than 8,500 Gt; much more so than the total ocean biomass (3 Gt), atmosphere (800 Gt) and forests (1,000 Gt) combined.

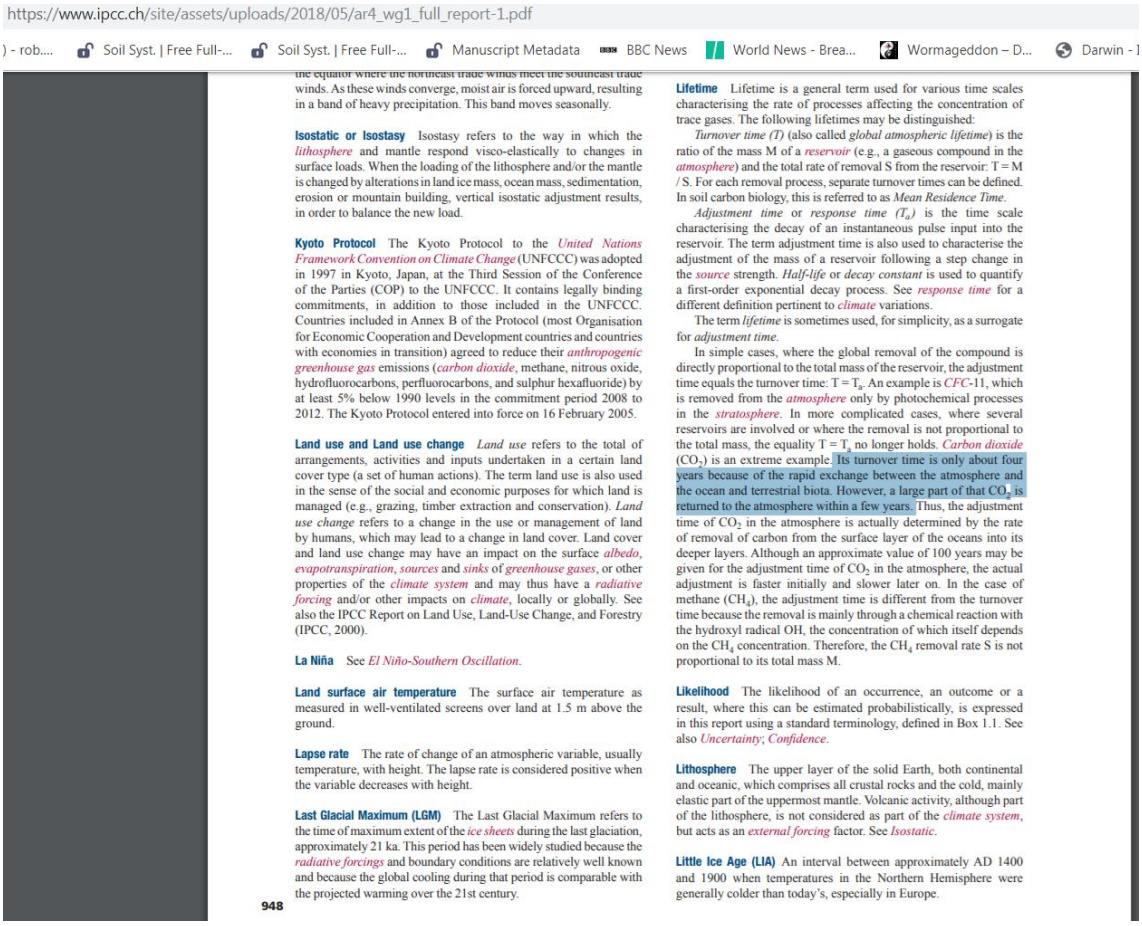


EDGAR version 4.2, fast track 2010 project – wiki; may be diversion as most accumulation of atmospheric CO2 is likely due to loss of vegetation and burning as much as excess emissions...

Forest loss more than fossil fuels excess
https://www.theguardian.com/environment/2018/oct/04/climate-change-deforestation-global-warming-report

RESIDENCE TIME

IPCC's AR4 WG1 (2007: 948 – www.ipcc.ch/site/assets/uploads/2018/05/ar4_wg1_full_report-1.pdf) say: "***Carbon dioxide (CO_2) is an extreme example. Its turnover time is only about four years because of the rapid exchange between the atmosphere and the ocean and terrestrial biota. However, a large part of that CO_2 is returned to the atmosphere within a few years***" Here is screenshot proof:



https://www.ipcc.ch/site/assets/uploads/2018/05/ar4_wg1_full_report-1.pdf

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the equator where the northeast trade winds meet the southeast trade winds. As these winds converge, moist air is forced upward, resulting in a band of heavy precipitation. This band moves seasonally.

Isostatic or Isostasy Isostasy refers to the way in which the *lithosphere* and mantle respond visco-elastically to changes in surface loads. When the loading of the lithosphere and/or the mantle is changed by alterations in land ice mass, ocean mass, sedimentation, erosion or mountain building, vertical isostatic adjustment results, in order to balance the new load.

Kyoto Protocol The Kyoto Protocol to the *United Nations Framework Convention on Climate Change* (UNFCCC) was adopted in 1997 in Kyoto, Japan, at the Third Session of the Conference of the Parties (COP) to the UNFCCC. It contains legally binding commitments, in addition to those included in the UNFCCC. Countries included in Annex B of the Protocol (most Organisation for Economic Cooperation and Development countries and countries with economies in transition) agreed to reduce their *anthropogenic greenhouse gas* emissions (*carbon dioxide*, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride) by at least 5% below 1990 levels in the commitment period 2008 to 2012. The Kyoto Protocol entered into force on 16 February 2005.

Land use and Land use change *Land use* refers to the total of arrangements, activities and inputs undertaken in a certain land cover type (a set of human actions). The term land use is also used in the sense of the social and economic purposes for which land is managed (e.g., grazing, timber extraction and conservation). *Land use change* refers to a change in the use or management of land by humans, which may lead to a change in land cover. Land cover and land use change may have an impact on the surface *albedo*, *evapotranspiration*, *sources* and *sinks* of *greenhouse gases*, or other properties of the *climate system* and may thus have a *radiative forcing* and/or other impacts on *climate*, locally or globally. See also the IPCC Report on Land Use, Land-Use Change, and Forestry (IPCC, 2000).

La Niña See *El Niño-Southern Oscillation*.

Land surface air temperature The surface air temperature as measured in well-ventilated screens over land at 1.5 m above the ground.

Lapse rate The rate of change of an atmospheric variable, usually temperature, with height. The lapse rate is considered positive when the variable decreases with height.

Last Glacial Maximum (LGM) The Last Glacial Maximum refers to the time of maximum extent of the *ice sheets* during the last glaciation, approximately 21 ka. This period has been widely studied because the *radiative forcings* and boundary conditions are relatively well known and because the global cooling during that period is comparable with the projected warming over the 21st century.

948

Lifetime Lifetime is a general term used for various time scales characterising the rate of processes affecting the concentration of trace gases. The following lifetimes may be distinguished:

Turnover time (T) (also called *global atmospheric lifetime*) is the ratio of the mass M of a *reservoir* (e.g., a gaseous compound in the *atmosphere*) and the total rate of removal S from the reservoir: T = M / S. For each removal process, separate turnover times can be defined. In soil carbon biology, this is referred to as *Mean Residence Time*.

Adjustment time or *response time* (T_a) is the time scale characterising the decay of an instantaneous pulse input into the reservoir. The term adjustment time is also used to characterise the adjustment of the mass of a reservoir following a step change in the *source* strength. *Half-life* or *decay constant* is used to quantify a first-order exponential decay process. See *response time* for a different definition pertinent to *climate* variations.

The term *lifetime* is sometimes used, for simplicity, as a surrogate for *adjustment time*.

In simple cases, where the global removal of the compound is directly proportional to the total mass of the reservoir, the adjustment time equals the turnover time: T = T_a. An example is *CFC*-11, which is removed from the *atmosphere* only by photochemical processes in the *stratosphere*. In more complicated cases, where several reservoirs are involved or where the removal is not proportional to the total mass, the equality T = T_a no longer holds. *Carbon dioxide* (CO_2) is an extreme example. Its turnover time is only about four years because of the rapid exchange between the atmosphere and the ocean and terrestrial biota. However, a large part of that CO_2 is returned to the atmosphere within a few years. Thus, the adjustment time of CO_2 in the atmosphere is actually determined by the rate of removal of carbon from the surface layer of the oceans into its deeper layers. Although an approximate value of 100 years may be given for the adjustment time of CO_2 in the atmosphere, the actual adjustment is faster initially and slower later on. In the case of methane (CH_4), the adjustment time is different from the turnover time because the removal is mainly through a chemical reaction with the hydroxyl radical OH, the concentration of which itself depends on the CH_4 concentration. Therefore, the CH_4 removal rate S is not proportional to its total mass M.

Likelihood The likelihood of an occurrence, an outcome or a result, where this can be estimated probabilistically, is expressed in this report using a standard terminology, defined in Box 1.1. See also *Uncertainty*; *Confidence*.

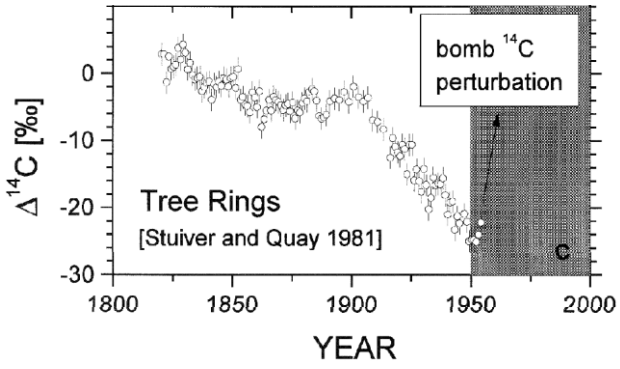
Lithosphere The upper layer of the solid Earth, both continental and oceanic, which comprises all crustal rocks and the cold, mainly elastic part of the uppermost mantle. Volcanic activity, although part of the lithosphere, is not considered as part of the *climate system*, but acts as an *external forcing* factor. See *Isostatic*.

Little Ice Age (LIA) An interval between approximately AD 1400 and 1900 when temperatures in the Northern Hemisphere were generally colder than today's, especially in Europe.

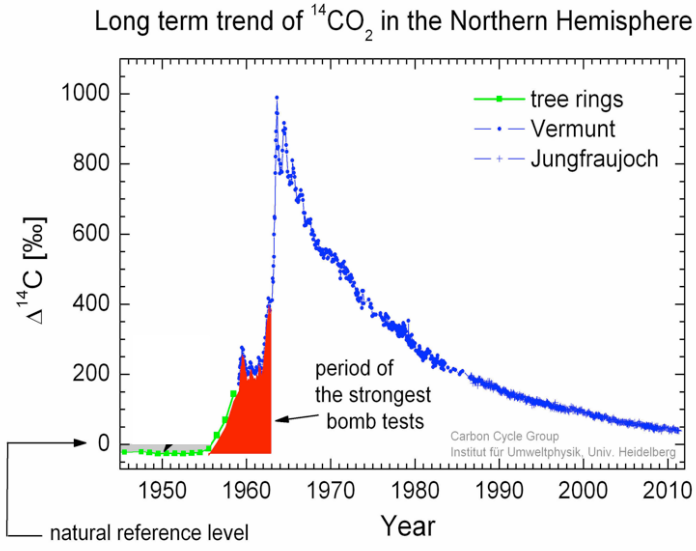
"***The mean residence time of carbon dioxide in the atmosphere is in the order of only 5 yr***" (Levin & Hesshaimer, 2000: 69). This datum these authors' based upon an atmospheric reservoir of 750 Gt C and an annual turnover exchange of 60 + 90 Gt C (total 150 Gt or about 20% of 750 Gt) from the "biosphere" plus passively from the ocean, respectively. These authors show correlation with anthropogenic burning of fossils fuels based upon the decline of atmospheric concentration of carbon istotope ^{14}C (Seuss effect) also state that "*highly populated areas show regional Suess effects up to $dD^{14}C$ = -100‰, especially during winter (Levin et al. 1989)*". The half-life of ^{14}C is in the order of 5,730 years thus its dilution in the atmosphere is from addition of ancient fossilized carbon (e.g. coal, oil, gas) rather than recycling of more recent organic carbon ($\Delta^{14}C$ is basically $^{14}C/^{12}C$). The authors state: "*It has*

been erroneously argued that the observed atmospheric CO2 increase since the middle of the 19th century may be due to an ongoing natural perturbation of gross fluxes between the atmosphere, biosphere, and oceans. That the increase is in fact a predominantly anthropogenic disturbance, caused by accelerated release of CO2 from burning of fossil fuels, has been elegantly demonstrated through 14C analyses of tree rings from the last two centuries (Stuiver and Quay 1981; Suess 1955; Tans et al. 1979). Figure 1c shows high-precision 14C data mostly from single tree rings of two Douglas-firs grown from 1815 to 1975 at the Olympic Peninsula..."

This is shown in their figure 1c reproduced below.



These authors, and others, accept that carbon accumulation in the atmosphere is at a rate of about +3 Gt per year or about 0.4% per annum; accepting that only about 50% of the excess CO2 is from burning fossil fuels (with about 7 Gt added per annum from this source). For carbon isotope, they found "*a decrease of about D14CO2 = -13‰ yr-1 in 1982 to about -4‰ yr-1 in 1998*". However, they also accept that calculations are particularly complex and the current atmospheric concentrations are approaching the base line level (see figure), thus, since half-life is over 5,700 years this must be due to dilution within the natural carbon cycle.



Mearns (2014) blog summarizes the fate of nuclear 14C or C14 - http://euanmearns.com/whats-up-with-the-bomb-model/ . Here are his figures 3-4 –

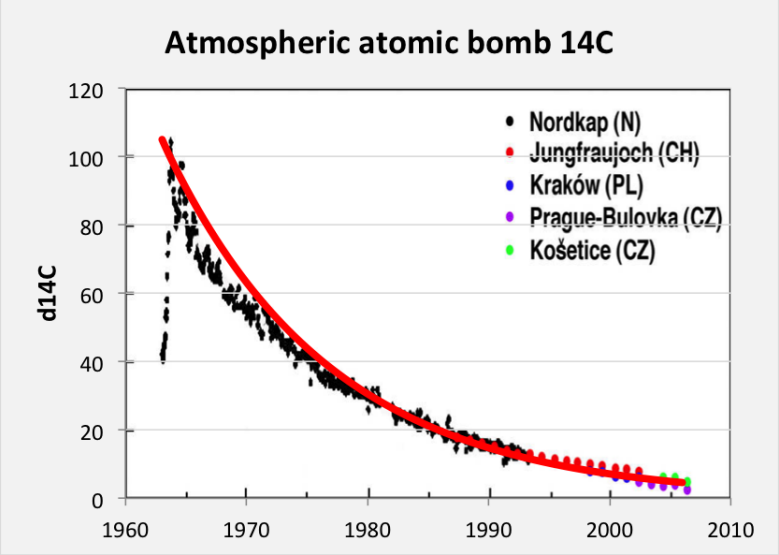


Figure 3 *Background image of bomb 14C from WUWT [2]. The red line represents a 7% per annum exponential decline, equivalent to a half-life ~ 10 years for CO2.*

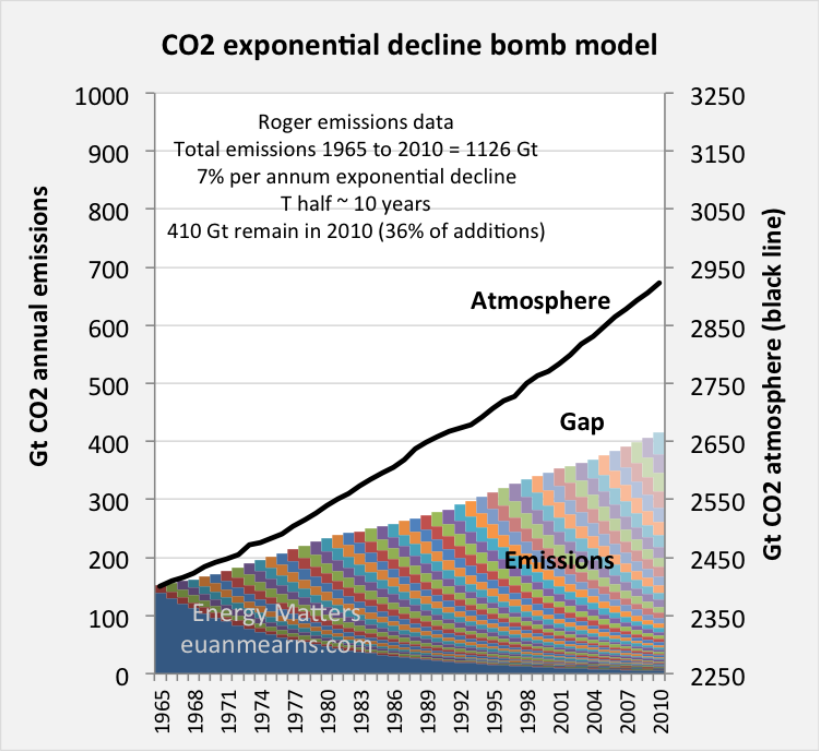


Figure 4 *Comparing actual emissions that are declined at 7% per annum with actual atmosphere there is gap that if the bomb 14C decline was correct would need to be filled by a natural CO2 flux.*

A response was: "**Photosynthesis prefers C-12 to C-14, but this is a small effect.** About half the sugars produced by photosynthesis are quickly oxidized to make the energy needed for plant

growth, movement, etc , releasing CO2 back into the air (this is called plant respiration). The other half of the sugars are used to build plant material (leaves, stems, etc). Deciduous trees and annual plants drop litter that rots within a year or two, but the C-14 that gets incorporated in tree trunks, etc., may be locked up for centuries. Working out the delays in releasing C-14 would require a major study, but I think Roger is right that quite a lot of the C-14 absorbed by terrestrial biomass is quickly returned to the atmosphere, which probably explains why the bomb data gives a time constant more like 16 years than 4 or 5."

So, my question is what is: the rate of accumulation of C14 in the ocean? The balance would be the approximate turnover rate on land. Actually, I really don't want to go down that rabbit hole. Ignore ocean and just think about land potential or likely flux in terms of net soil carbon gain alone.

From Wiki https://en.wikipedia.org/wiki/Carbon-14 :25/2/2019

"In 2009 the activity of ^{14}C was 238 Bq per kg carbon of fresh terrestrial biomatter, close to the values before atmospheric nuclear testing (226 Bq/kg C; 1950).[33]

Total inventory[edit]

The inventory of carbon-14 in Earth's biosphere is about 300 megacuries (11 EBq), of **which most is in the oceans**.[34] The following inventory of carbon-14 has been given:[35]

- Global inventory: ~8500 PBq (about 50 t)
  - Atmosphere: 140 PBq (840 kg)
  - Terrestrial materials (soil, plants, fungi and animals including humans) : the balance
- From nuclear testing (till 1990): 220 PBq (1.3 t)"

This compares to another independent study http://euanmearns.com/the-residence-time-of-co2-in-the-atmosphere-is-33-years/ that states:

"The residence time of CO2 in the atmosphere is …. 33 years?

Posted on September 3, 2014 by Roger Andrews

By Roger Andrews
An important consideration in estimating future greenhouse warming risks is how long CO2 remains in the atmosphere. Here I present the results of a simple mass balance model that provides a near-perfect fit between CO2 emissions and observed atmospheric CO2 using a CO2 residence time of 33 years. This, however, is significantly longer than 36 peer reviewed estimates that cluster between 5 and 15 years and much shorter than IPCC's estimates of 100 years or longer, hence the question mark in the title.

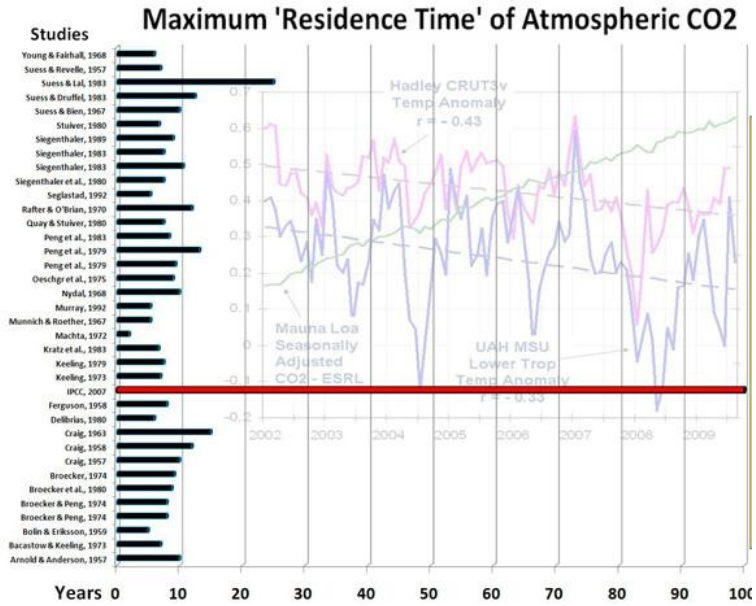


Figure 1: *CO2 Residence Time Estimates (data: Jennifer Marohasy)"*

An excellent summary of the misinterpretations of this diagram/chart is found here: https://www.skepticalscience.com/co2-residence-time.htm . It says:

"So What is Dodgy About The Diagram?

The IPCC actually gives a residence time of about 4 years in the 2007 AR4 WG1 report (see page 948), which is completely in accordance with the other papers referenced in the diagram. The confusion arises because there are two definitions of "lifetime" that describe different aspects of the carbon cycle. These definitions are clearly stated on page 8 of the first (1990) WG1 IPCC report (on page 8):

The turnover [residence] time of CO2 in the atmosphere, measured as the ratio of the content to the fluxes through it, is about 4 years. This means that on average it takes only a few years before a CO2 molecule in the atmosphere is taken up by plants or dissolved in the ocean. This short timescale **must not be confused** with the time it takes for the atmospheric CO2 level to adjust to a new equilibrium if sources or sinks change. This adjustment time, corresponding to the lifetime in table 1.1 is of the order 50-200 years, determined mainly by the low exchange of of carbon between surface waters and deep the ocean, **The adjustment time is important for the discussion on global warming potential**, c.f. Section 2.2.7". [**emphasis** mine]

So clearly what has happened is that the author of the diagram has done exactly what the IPCC have warned against, which is to confuse residence (turnover) and adjustment time. As the IPCC WG1 report makes a point of clarifying this issue, the confusion would have been avoided if time was taken to actually read what was written in the IPCC report."

All of this is agreeable to me. But... the problem is that the revised soil carbon sinks (>8,580 Gt C) and land NPP rates (>218 Gt C/yr) require all these figures to be recalculated. Thus I think my new calculation are actually much more correct and relevant.

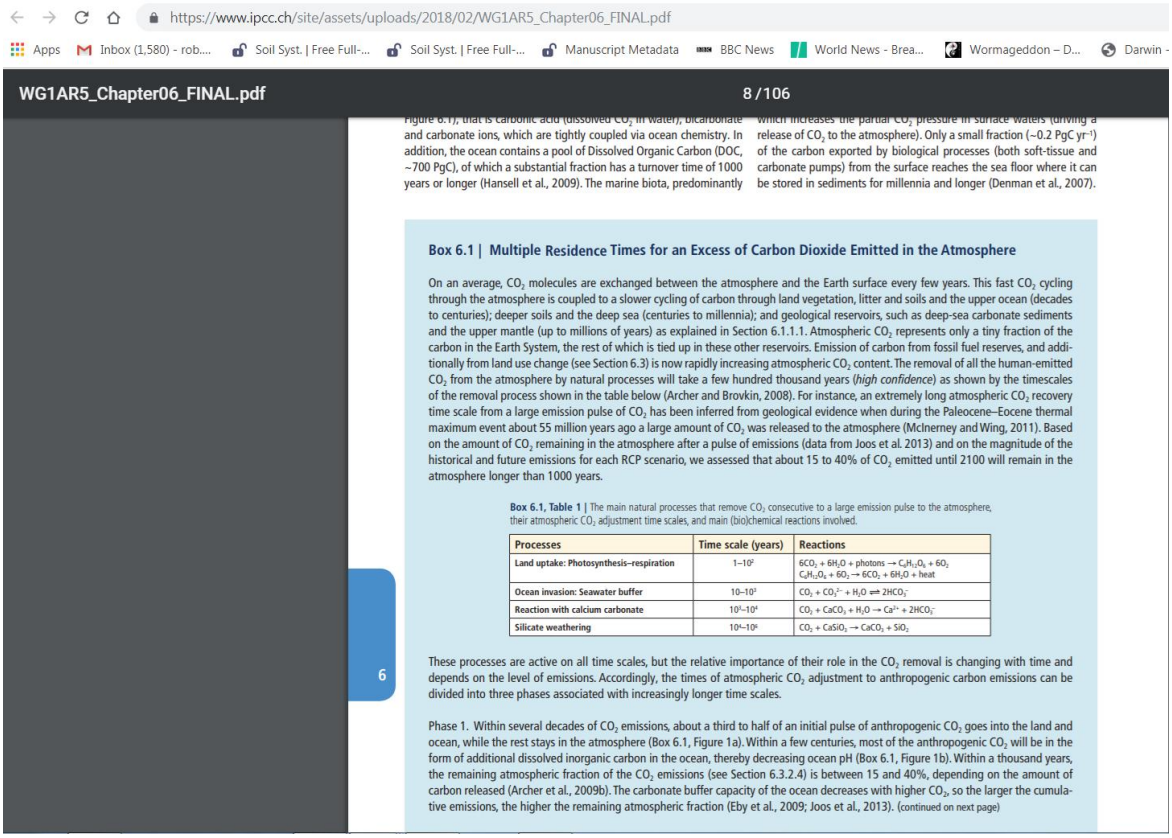
Compare all this to my calculations which is of residence time of just ~3 years and neutralization of annual excess atmospheric carbon in just one week!

Goldberg (2008) for different and somewhat controversial reasons that have been either ignored or strongly contested, estimated similar transit times and that the annual global fossil fuel emissions are entirely neutralized by Nature in as little as 12 days (F. Goldberg 2008 "*Rate*

of Increasing Concentrations of Atmospheric Carbon Dioxide Controlled by Natural Temperature Variations" https://journals.sagepub.com/doi/abs/10.1260/095830508786238369).

However, this too does not factor in my revised soil carbon stores and greatly increased terrestrial NPP rates.

Here is IPCC 2013 summary showing terrestrial residence time of 1 – 100 years https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter06_FINAL.pdf:


https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter06_FINAL.pdf
WG1AR5_Chapter06_FINAL.pdf
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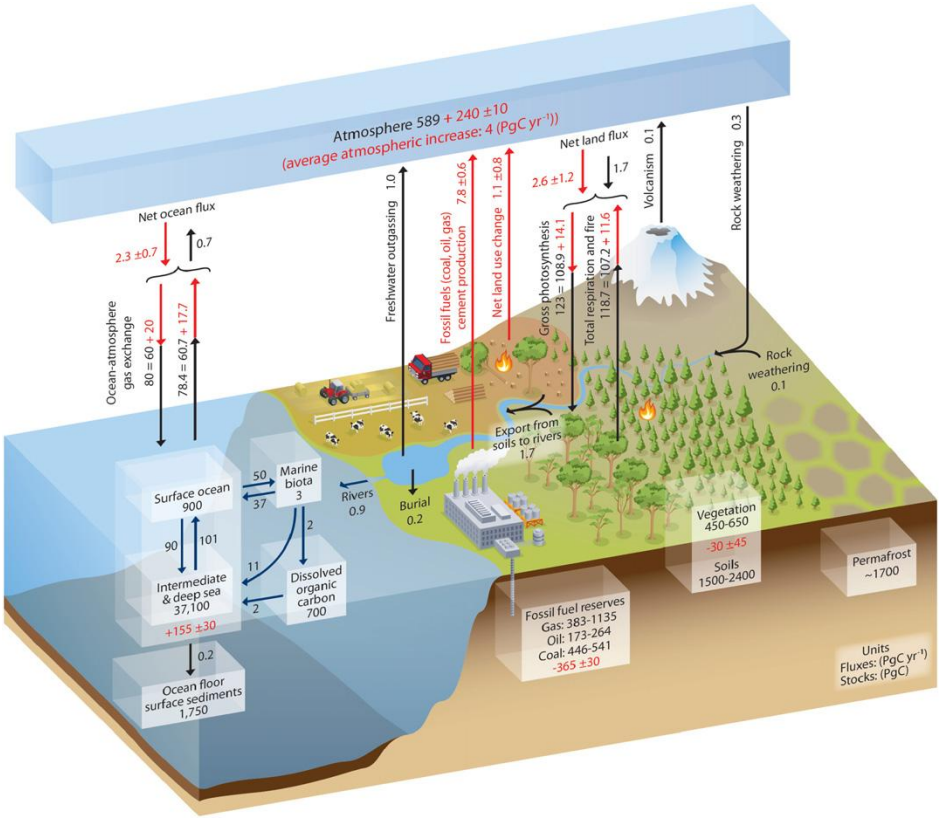
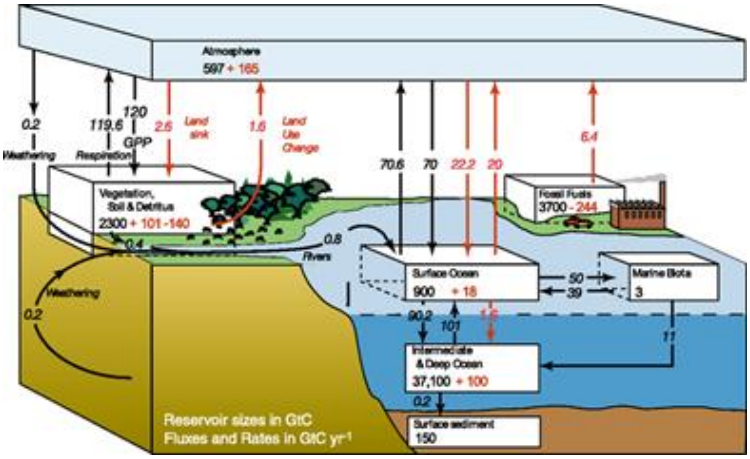
and carbonate ions, which are tightly coupled via ocean chemistry. In addition, the ocean contains a pool of Dissolved Organic Carbon (DOC, ~700 PgC), of which a substantial fraction has a turnover time of 1000 years or longer (Hansell et al., 2009). The marine biota, predominantly
of the carbon exported by biological processes (both soft-tissue and carbonate pumps) from the surface reaches the sea floor where it can be stored in sediments for millennia and longer (Denman et al., 2007).
Box 6.1 | Multiple Residence Times for an Excess of Carbon Dioxide Emitted in the Atmosphere
On an average, CO_2 molecules are exchanged between the atmosphere and the Earth surface every few years. This fast CO_2 cycling through the atmosphere is coupled to a slower cycling of carbon through land vegetation, litter and soils and the upper ocean (decades to centuries); deeper soils and the deep sea (centuries to millennia); and geological reservoirs, such as deep-sea carbonate sediments and the upper mantle (up to millions of years) as explained in Section 6.1.1.1. Atmospheric CO_2 represents only a tiny fraction of the carbon in the Earth System, the rest of which is tied up in these other reservoirs. Emission of carbon from fossil fuel reserves, and additionally from land use change (see Section 6.3) is now rapidly increasing atmospheric CO_2 content. The removal of all the human-emitted CO_2 from the atmosphere by natural processes will take a few hundred thousand years (*high confidence*) as shown by the timescales of the removal process shown in the table below (Archer and Brovkin, 2008). For instance, an extremely long atmospheric CO_2 recovery time scale from a large emission pulse of CO_2 has been inferred from geological evidence when during the Paleocene–Eocene thermal maximum event about 55 million years ago a large amount of CO_2 was released to the atmosphere (McInerney and Wing, 2011). Based on the amount of CO_2 remaining in the atmosphere after a pulse of emissions (data from Joos et al. 2013) and on the magnitude of the historical and future emissions for each RCP scenario, we assessed that about 15 to 40% of CO_2 emitted until 2100 will remain in the atmosphere longer than 1000 years.
Box 6.1, Table 1 | The main natural processes that remove CO_2 consecutive to a large emission pulse to the atmosphere, their atmospheric CO_2 adjustment time scales, and main (bio)chemical reactions involved.
Processes
Time scale (years)
Reactions
Land uptake: Photosynthesis–respiration
$1–10^2$
$6CO_2 + 6H_2O + photons \rightarrow C_6H_{12}O_6 + 6O_2$
$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + heat$
Ocean invasion: Seawater buffer
$10–10^3$
$CO_2 + CO_3^{2-} + H_2O \rightleftharpoons 2HCO_3^-$
Reaction with calcium carbonate
$10^3–10^4$
$CO_2 + CaCO_3 + H_2O \rightarrow Ca^{2+} + 2HCO_3^-$
Silicate weathering
$10^4–10^6$
$CO_2 + CaSiO_3 \rightarrow CaCO_3 + SiO_2$
6
These processes are active on all time scales, but the relative importance of their role in the CO_2 removal is changing with time and depends on the level of emissions. Accordingly, the times of atmospheric CO_2 adjustment to anthropogenic carbon emissions can be divided into three phases associated with increasingly longer time scales.
Phase 1. Within several decades of CO_2 emissions, about a third to half of an initial pulse of anthropogenic CO_2 goes into the land and ocean, while the rest stays in the atmosphere (Box 6.1, Figure 1a). Within a few centuries, most of the anthropogenic CO_2 will be in the form of additional dissolved inorganic carbon in the ocean, thereby decreasing ocean pH (Box 6.1, Figure 1b). Within a thousand years, the remaining atmospheric fraction of the CO_2 emissions (see Section 6.3.2.4) is between 15 and 40%, depending on the amount of carbon released (Archer et al., 2009b). The carbonate buffer capacity of the ocean decreases with higher CO_2, so the larger the cumulative emissions, the higher the remaining atmospheric fraction (Eby et al., 2009; Joos et al., 2013). (continued on next page)

On similar topic: Harde (2017) summarized: "*The anthropogenic contribution to the actual CO2 concentration is found to be 4.3%, its fraction to the CO2 increase over the Industrial Era is 15% and the* ***average residence time 4 years***." A rebuttal paper by Kohler et al. (2018) rejects many of Harde's claims but accepts "*reasonable approximations for the residence time*". They state "*Total anthropogenic CO2 from fossil fuel and cement production emitted between 1750 and 2010 has accumulated to 365 PgC (Le Qu´er´e et al., 2016). A further 153 PgC was emitted in the same time interval from land use changes (Le Qu´er´e et al., 2016)... The missing residual of the anthropogenic emissions of 130 PgC is assigned to terrestrial carbon uptake*."

However, both papers understate, or ignore, terrestrial carbon (as in IPCC figure &.1 below) having at most just 2,400 Gt soil carbon rather than my estimated minimum of 8,500 Gt and annual global photosynthesis at just 123 Gt p.a. rather than my estimate of about 240 Gt p.a. https://www.mdpi.com/2571-8789/2/4/64. Harde, as with IPCC, also shows an inconsequential marine biota of just 3 Gt C in total!



IPCC (2013) AR5 WG1 figure 6.1. Cf. IPCC AR4 WG1 figure 7.3 below.



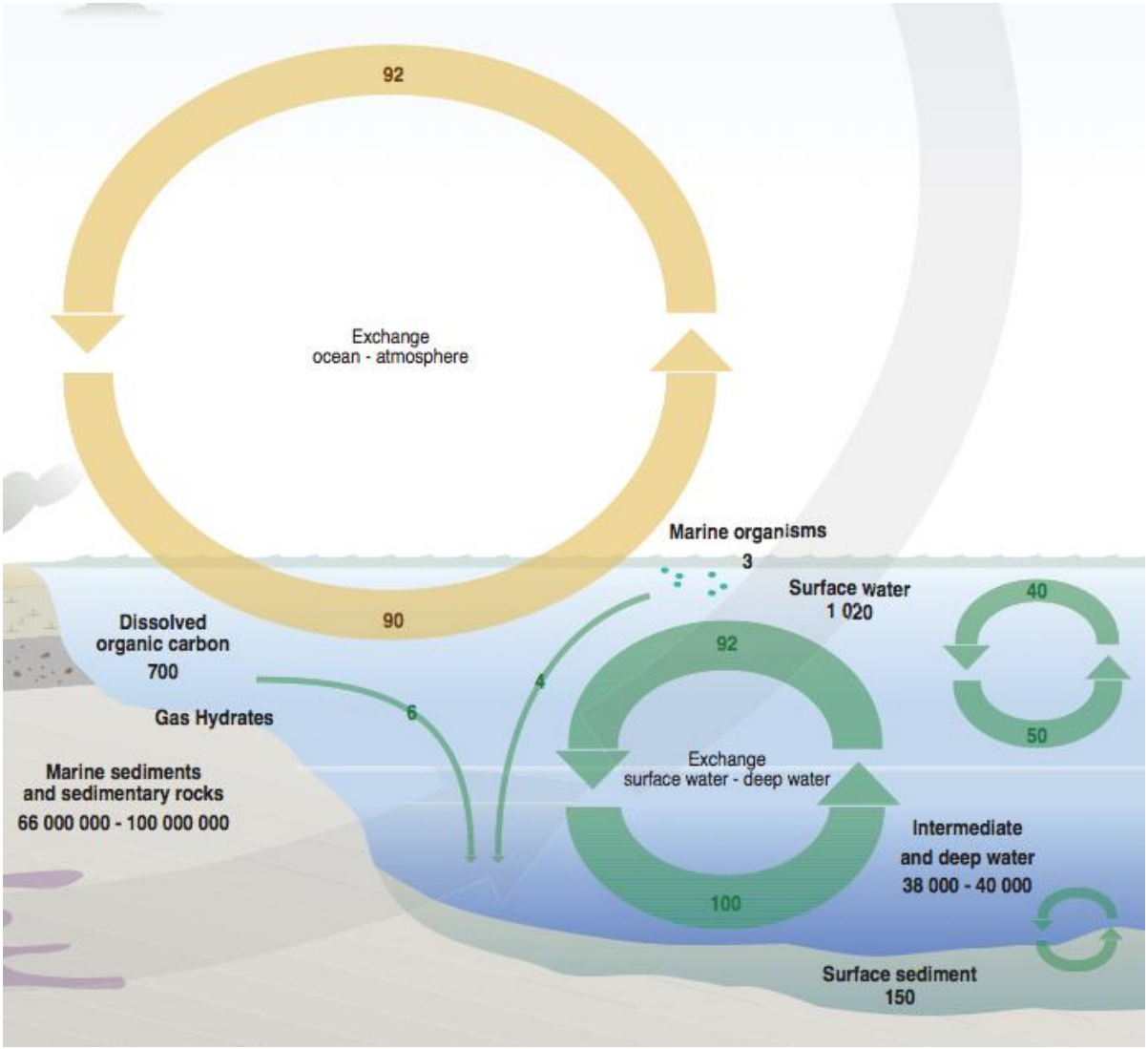
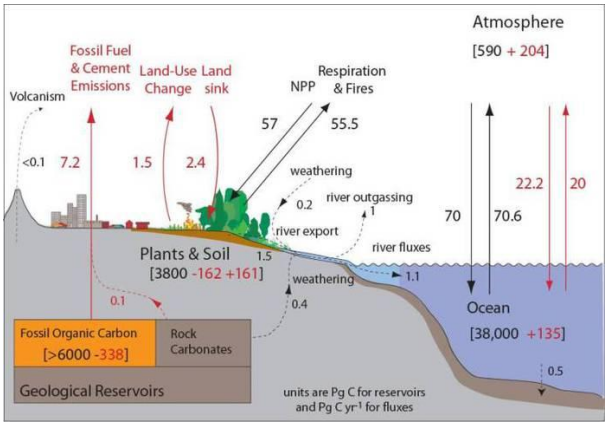
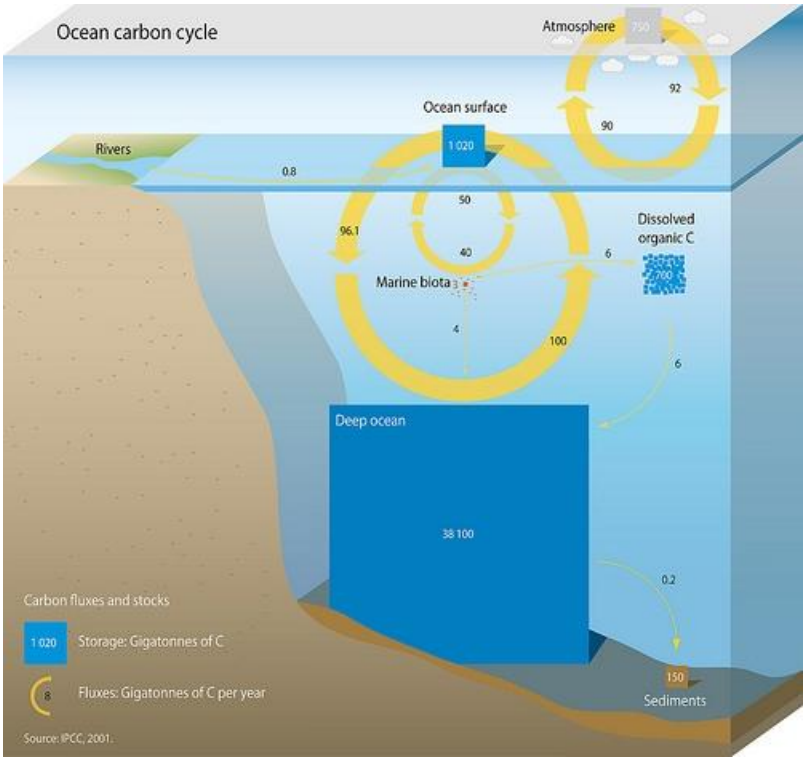


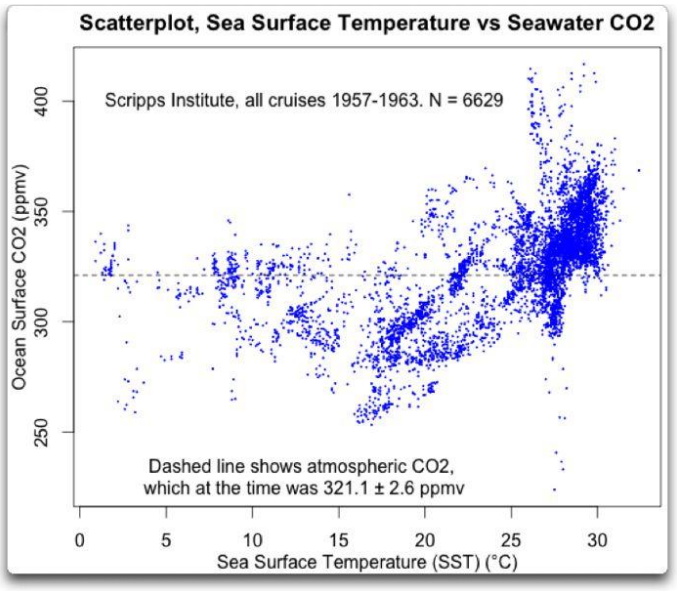
Figure 5 *The ocean carbon cycle according to IPCC Grid Arendal. BULLCRAP - ONLY 2 Gt EXCHANGE TO OCEANS WITH JUST 3 GT MARINE ORGANISMS AS NPP SO IT'S NEGLIGIBLE!!*



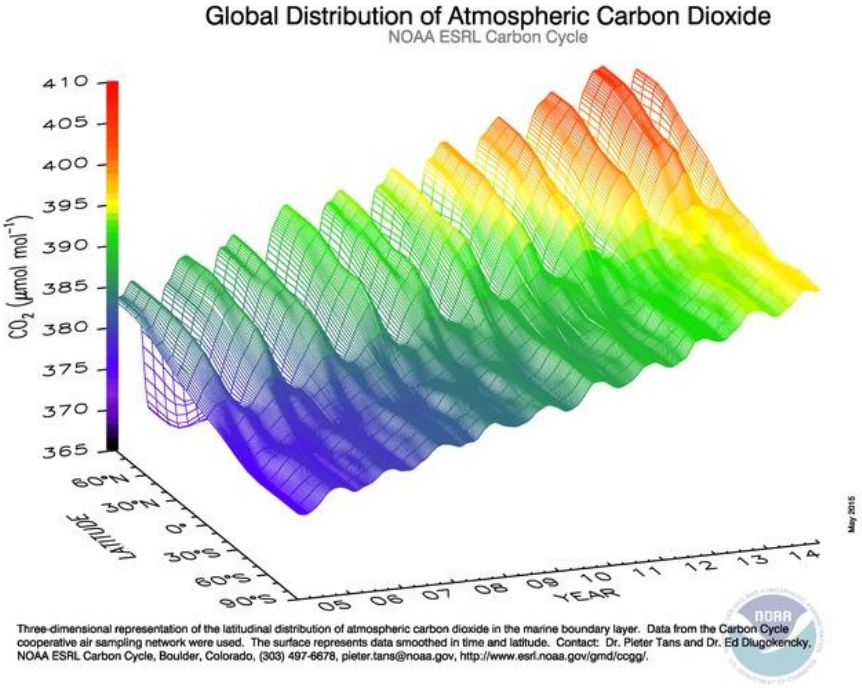
https://www.pmel.noaa.gov/co2/file/Carbon+Cycle+Graphics (almost same as NASA BULLCRAP C data)

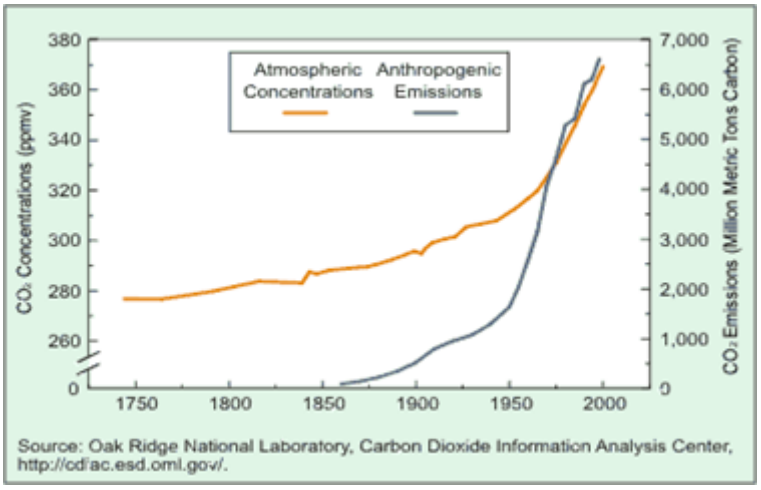


IPPC 2001 of the ocean's passive air-sea exchange of CO2 which is governed by Henry's Law.

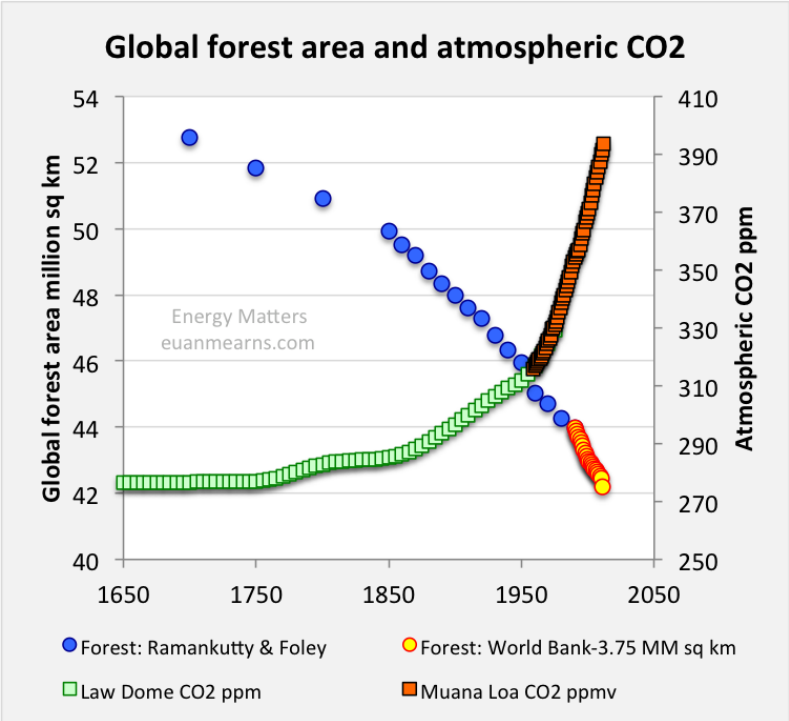


Scripps plots of ocean CO_2 relative to temp (with atmospheric CO_2 dotted grey line), i.e. almost equilibrium but holds more CO_2 in warmer waters. Maybe, it's not limiting for photosynthesis.





The contribution to the total carbon budget from burning fossil fuels is only about 3-4% of the annual fluctuation and there is little evidence that it is the actual fossil carbon that is accumulating alone. Rather it is part of the mix. An equally, if not more, plausible cause would be the reduction in photosynthesis or the lack of storage of carbon in diminishing soil humus.



IPCC is wrong also in their cancelling out of burning biomass. This is not a balance as the material if not burned can be uses as compost or mulch to contribute, significantly, to ultimate soil carbon storage in recalcitrant humus.

My other major contribution is to allow that 4 x land means **four times natural N2 fixation**.

Thus, of the world's global problems the issue of climate change is third most important after extinction and nitrogen excess. This however needs to be predicated upon the loss of topsoil being the most urgent and the most ignored of issues the fixing of which will resolve all others.

The message that a need is to concentrate all our resources to restoration of the natural world as the most urgent priority (as Bill Mollison said) is reemphasized. Thus misdirecting funds and talent to pointless space or marine exploration should be put on hold (postponed) until our house (home planet) is in order. The final reminder is that Economy is subordinate to Ecology.

Conclusion is that the 4p1000 initiative is eminently achievable at one quarter of its concentration and much more rapidly than supposed. But only if action is immediately taken to ensure that all organic wastes and manures are recycled back onto the fields, preferably after vermicomposting to enhance the product and the health of the soil and its vital mesofaunal earthworm residents.

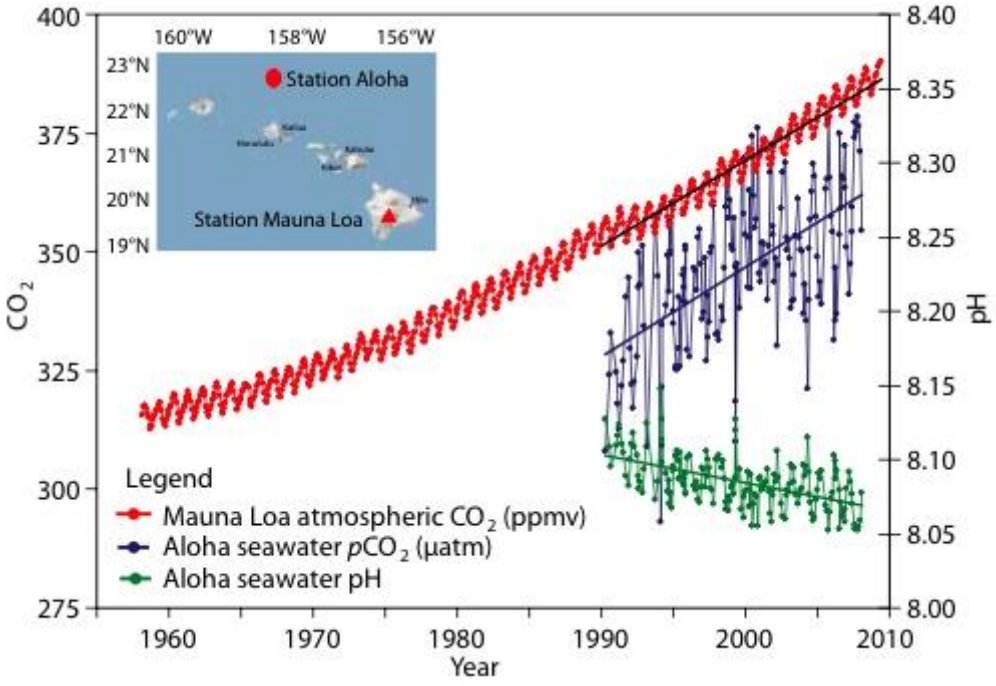
Precautionary principal to reduce emissions also to reduce pollution – not just do no harm, rather "do good" (see discussion below).

Carbon in agronomy soil – Zomer et al (2017) Global Sequestration Potential of Increased Organic Carbon in Cropland Soils: https://www.nature.com/articles/s41598-017-15794-8. They summarize: "*Croplands worldwide could sequester between 0.90 and 1.85 Pg C/yr, i.e. 26–53% of the target of the "4p1000 Initiative: Soils for Food Security and Climate". The importance of intensively cultivated regions such as North America, Europe, India and intensively cultivated areas in Africa, such as Ethiopia, is highlighted. Soil carbon sequestration and the conservation of existing soil carbon stocks, given its multiple benefits including improved food production, is an important mitigation pathway to achieve the less than 2 °C global target of the Paris Climate Agreement*."

[Cf. 4p1000 from the Sydney crew that only consider co2 emissions and ignore co2 respiration]...

Indeed, a recent analysis estimates that agricultural land uses (including cropland and grazing) have resulted in a loss of 133 Pg of carbon over the past 12 000 years of human land use (Sanderman et al., 2017).

The key question of a link between SOM and crop yields were claimed by a recent meta analysis to be surprisingly lacking in quantitative evidence (Oldfield et al. 2018 - https://www.soil-journal.net/5/15/2019/). This may be questioned as there is ample information from independent studies on organic crop yields compared to chemical (e.g. Blakemore 2018a https://www.mdpi.com/2571-8789/2/2/33). What their synthetic model study supposedly found was that yields did indeed increase by between 11–32% for maize and wheat when SOM raised up to about 2% after which there was seemingly little difference to chemical fertilizer yields which could also be construed that fertilizers offered no advantage.



Above fig from https://www.skepticalscience.com/news.php?p=2&t=72&&n=1534

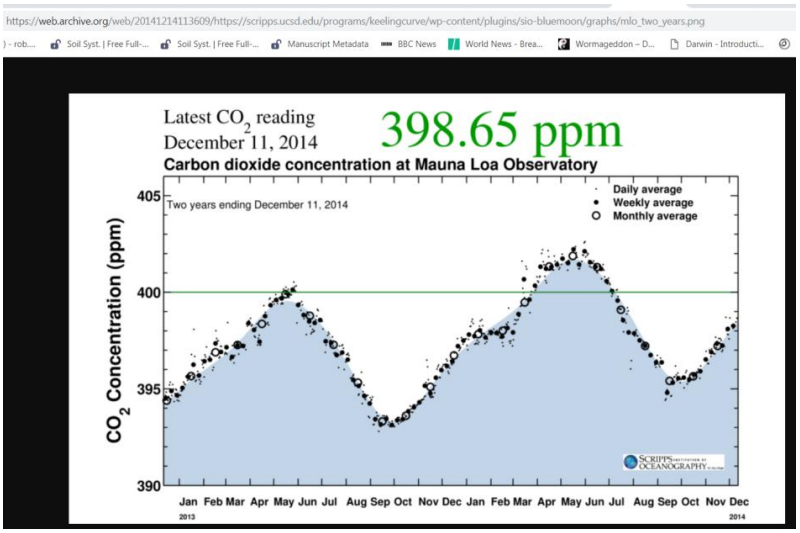
Fake news: "The world oceans are definitely the most important carbon reservoir, with a buffering capacity for atmospheric CO2 largest on time scales of centuries and longer. In contrast, the buffering capacity of the terrestrial biosphere is largest on shorter time scales from decades to centuries. Although today equally important, the role of the terrestrial biosphere as a sink of anthropogenic CO2 emissions is still poorly understood. http://archiv.ub.uni-heidelberg.de/volltextserver/6862/1/LevinRAD2000.pdf"

https://skepticalscience.com/human-fingerprint-in-global-warming.html

Note that ocean acidification, supposedly so important, is less sever, less rapid and less critical that soil acidification (see Blakemore 2018b). Moreover, as the land problem is related mainly to nitrates in originating in synthetic N fertilizer use, then these nitrates will also be affecting the ocean via acid rain. This is under-researched.

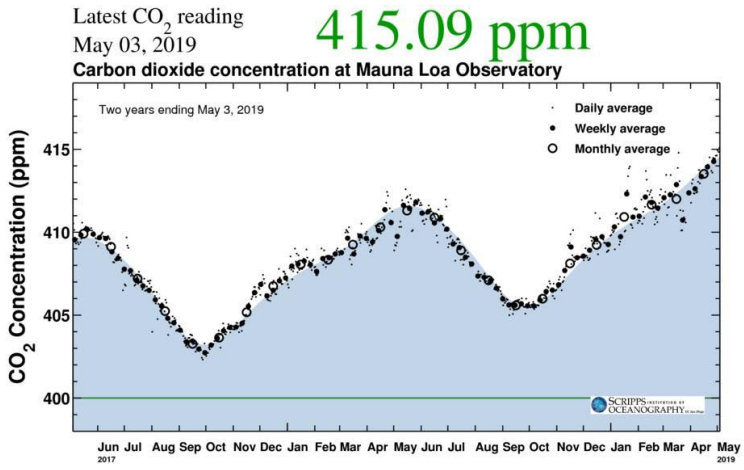
Comparison of Scripps Mauna Loa CO2 data

Below is 2013/2014 from Wayback machine as far as it will go for Scripps Mauna Loa CO2 data crossing 400 ppm for the first time. Interestingly, there seems to be a plateau of CO2 on Moana Loa in Jan-Feb, 2014 which possibly corresponds to a particularly cold spell in continental USA with snow on Hawaii (!) and also to the warmest winters in Alaska and some other places. NOAA said it was the 4th warmest January on record - https://weather.com/science/environment/news/january-4th-warmest-record-continuing-warming-trend-20140220 .



However... a US federal government shutdown for two weeks in early October, 2013 seems to have no response, as for 2018/2019, but both were for just 800,000 staff in each case.

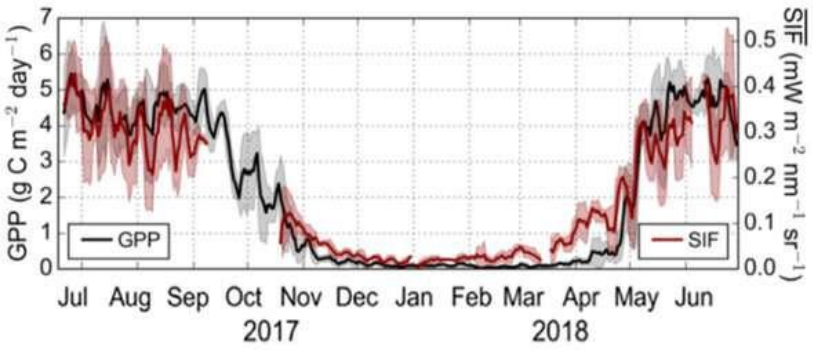
The current state (below): just 5 years later and 15 ppm higher! Horrendous difference! In 2018many countries, including Australia and Japan suffered extremes - https://www.straitstimes.com/asia/east-asia/earthquakes-rains-heatwave-typhoon-japans-brutal-summer-2018 . 2019 looks to be even more stark...



This is new record of over 415 ppm! But the trajectory for 2019 is up to 416 ppm... Already Japan has record May heat of over 40°C. https://www.straitstimes.com/asia/east-asia/hokkaido-sizzling-in-temperatures-as-high-as-395-deg-c-as-unseasonal-heat-wave-grips .

It would be **really interesting** to see around 11 September 2001 when all USA flights grounded and Wednesday 14 April 2010 when Eyjafjallajökull erupted stopping all air-traffic in Europe. Effects of Chinese New Year in Feb and their National Day (Golden Week) in October??

A 2019 study of boreal trees' GPP/scintillation shutdown overwinter corresponds to CO_2 cycles.



Shutdown of industry is ideally for a week in early/mid to late May, around Rachel Carson's birthday. I suggest calling it Carson's break (or perhaps "carsoff's"...). This would test whether human emissions affect CO_2 levels and, if so, would be a great start to redressing XS CO_2.

LEAF LITTER:

Leaf-litter quoted by Lal (2010: fig. 1) as 40–80 Gt giving median value of 60 Gt; but Bar-On et al. (2018) say "*Estimates based on direct field observations put the global pool of dry weight from plant litter at about ≈80 Gt C*". Thus 60 Gt may be too low. Nevertheless, 800 Gt atmospheric carbon recycled through likely total leaf litter (800/80) is 10 years; when terrain doubles leaf litter totals then this halves (80/160 =) to just 5 years to recycle all atmospheric C!

BURNING ISSUE:

"Surprisingly, (FAO AFOLU, 2014: 43, 47, fig. 3-5 also shown below http://www.fao.org/docrep/019/i3671e/i3671e.pdf) burning of crop residues and savannah only gave 197 and 287 Mt CO_2eq or nearly 4 and 5%, respectively, (total 9%) of total emissions from agriculture, which itself is just 50% of total AFOLU. **In general, actual CO_2 released by burning vegetation (about 1.9 kg per kg burnt due to O_2 oxidation) is not included because, I believe, IPCC considers it balanced by carbon taken up during plant growth, so the emissions are carbon-neutral. If so, this is mistaken in my view as all plants can be mulched or composted and carbon returned to the soil rather than go up as smoke into the atmosphere. Perhaps this managed burn vs. compost aspect is an important yet overlooked consideration…"** https://vermecology.wordpress.com/2017/05/27/slimeless-spring-ii/
"

FAO AFOLU, 2014: 3 http://www.fao.org/docrep/019/i3671e/i3671e.pdf *"According to IPCC, in 2005 GHG emissions from agriculture were 5.1-6.1 GtCO2 eq yr-1 , with another 7.5-8.5 GtCO2 eq yr-1 related to forestry and other land use activities (FOLU)—the latter dominated by deforestation and forest degradation, peat fires and drainage. Compared to total estimated anthropogenic GHG emissions of about 50 GtCO2 eq yr-1 in 2005, the AFOLU sector thus accounted for a third of total anthropogenic forcing (Smith et al., 2007). FAO has developed and published in 2013 a new emissions database for the AFOLU sector (http://faostat3.fao.org/faostat-gateway/go/to/browse/G1/*/E)..."*

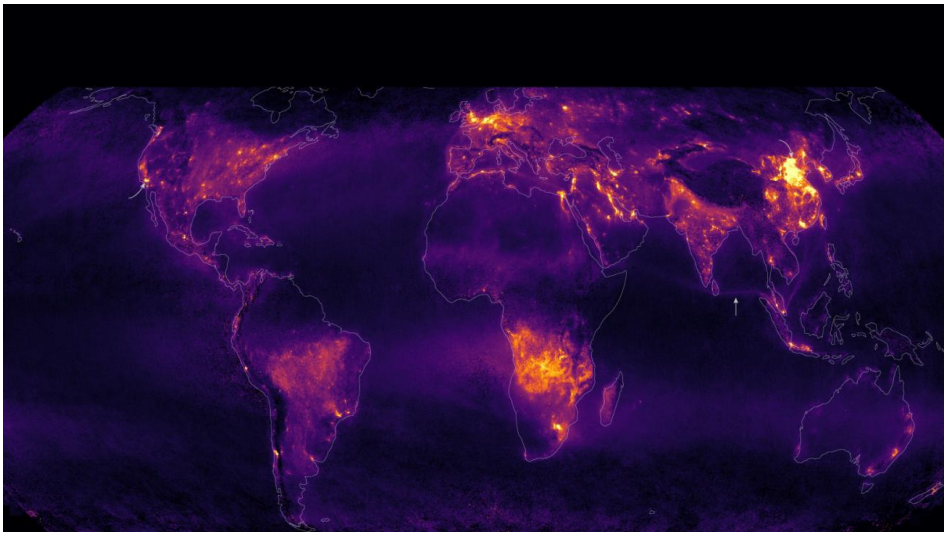
https://insideclimatenews.org/news/23082018/extreme-wildfires-climate-change-global-warming-air-pollution-fire-management-black-carbon-co2 : Although the exact quantities are difficult to calculate, **scientists estimate** that wildfires emitted about 8 billion tons of CO2 per year for the past 20 years. In 2017, total global CO2 emissions reached **32.5 billion tons**, according to the International Energy Agency.

When they calculate total global CO2 output, scientists don't include all wildfire emissions as net emissions, though, because some of the CO2 is offset by renewed forest growth in the burned areas. As a result, they estimate that wildfires make up 5 to 10 percent of annual global CO2 emissions each year.

While fires have been worsening in some regions, globally the total burned area and emissions from wildfires have actually decreased over the past 20 years, said Guido van der Werf, a Dutch researcher who analyzes trends for the **Global Fire Emissions Database**. The global decline is because burned savannas and rainforests in the tropics are being converted to agricultural lands, which are less fire-prone.

https://www.carbonbrief.org/co2-emissions-from-wildfires-have-fallen-over-past-80-years-study-finds

As well as litter and roots, the burning of organic materials also contributes substantially. IPCC says it is cancelled out but they ignore that wood and wastes that are not burned add to SOC.



NASA FIRMS website - Prescribed burning in Australia. Rice husk burning. Sugarcane trash burning. Savannah fires and the deliberate forest and peat fires in Asia for palm oil and snake hunting. Forests take 80 years to recover - https://theconversation.com/forest-soil-needs-decades-or-centuries-to-recover-from-fires-and-logging-110171 . That land biomass may be important is shown by the recent American Dying paper - https://www.bbc.com/news/science-environment-47063973 .

BBC (2019) "**More than two billion people rely on wood fuel for energy**, while around four billion rely on natural medicines. Some three-quarters of our food crops require pollination by insects." – Yes maybe but most crops are grains that pollinate by wind not insects! It is important not to mislead.

https://www.pbl.nl/en/news/newsitems/2019/transition-to-clean-cooking-good-for-people-and-planet. Also in India projects like those of Janak McGilligan advocate solar ovens.

Crops - There are more than 570m farms worldwide; more than 90% are run by an individual or family and rely primarily on family labour. They produce about 80% of the world's food.
https://www.theguardian.com/news/2019/jan/28/can-we-ditch-intensive-farming-and-still-feed-the-world?utm_term=RWRpdG9yaWFsXodyZWVuTGlnaHQtMTkwMjAx&utm_source=esp&utm_medium=Email&utm_campaign=GreenLight&CMP=greenlight_email

Broadcaster Sir David Attenborough is part of the popular problem not the solution...

"*humans can create a world with clean air and water, unlimited energy and sustainable fish stocks, but only if decisive action is taken now.*" – Sorry, but Sir David ignores clean & healthy soil providing 99% of food!

"Over the next two years there will be United Nations decisions on climate change, sustainable development and a new deal for nature. Together these will form our species' plan for a route through the Anthropocene." So said Attenborough at Davos in 2019. With this Sir David is a major part of the problem by promoting ocean (e.g. Blue Planet) and his "*clean air and water*" at the expense of and ignoring the major concern and most threatened **clean and healthy soil**. Also, fish stocks are a diversion as the total marine plus aquaculture contribution to human food is much less than 1% in total. Oceans as a whole only support about 0.2% of global biomass. 99.8% of life on Earth is, well, in the earth. Where is the Soil Ecology Institute to promote this major ecosystem??

This from the Daily Express in April, 2019: "The veteran BBC wildlife presenter, whose stunning programmes have influenced millions of people for decades, said it was vital we work to "solve the major problems" of the oceans. If we don't, "the world is going to starve", he said. Launching his new Netflix series, Our Planet, a passionate Sir David, 92, again highlighted the issue of plastic waste and also raised the problem of "acidification". This is where the ocean absorbs carbon dioxide, killing plankton, one of the first building blocks of the food chain. This might eventually see the "oceans die".

Sorry to be repetitive, but the ocean only provides 0.3% of human food and is mostly a wet desert with no biodiversity due not to plastic but to no sunlight, nutrients and, ironically, no CO2 which is in passive gaseous exchange with the atmosphere. Hence the smartest animals in the ocean are the air breathers.... Also, the acidification, plastic pollution and extinctions problem is 1,000,000 times more urgent, critical and crucial in the soil not in the water!!!!

Also the claimed 300 Gt ocean microbe biomass recalculated as just 4 Gt in total - https://phys.org/news/2012-08-biomass-life-planet-earth.html . What I did find, in my research is that there is disagreement about the ocean subsurface measurement. A paper by Kallmeyer *et al.* from 2012 said it was a huge overestimate. They came up with an estimate of 1.5-22 Pg C. That is a *fraction* of the values from Whitman *et al.*

Another Furphy from CoDL group...

"Deep Life" carbon 15 billion and 23 billion tons of carbon and occupy an estimated volume almost twice that of the oceans combined, scientists from the Deep Carbon Observatory reported yesterday (December 10).

Magnabosco et al. (2018) found "*Using our updated continental subsurface cellular estimate and existing literature, we estimate that the total global prokaryotic biomass is approximately 23 to 31 Pg of carbon C (PgC), roughly 4 to 10 times less than previous estimates." "*the global prokaryote biomass is ~23–31 PgC. This global C estimate is ~10% of the original 303 PgC value reported by Whitman et al. and half of the continental subsurface biomass estimate (62 PgC) proposed by Bar-On et al." 1 Pg C = 1 Gt C.

Census of Deep Life (http://codl.coas.oregonstate.edu/) or https://deepcarbon.net/community/deep-lfe had a press release on 10th December 2018 giving deep carbon total of 15–23 Gt C (https://deepcarbon.net/life-deep-earth-totals-15-23-billion-tonnes-carbon). This is seemingly extracted from Magnabosco et al. (2018) who provide a detailed reasoning for a total of ~7–11 x 10^{23} prokaryotic cells in the global sub-surface/seafloor with total biomass (each cell with 21 fg C) of ~15–23 Gt divided approximately 50:50 for continental to ocean sub-surfaces. Other totals from Magnabosco et al. (2018) are presented in following table with soil component updated (x 4) to comply with Blakemore (2018b).

	Numbers of prokaryote cells x 10^29				
Biome	Lo estimate	Hi estimate	Soil upped (x4)	Biomass GtC	%
Soil	2.6	2.6	10.4	21.8	42
Continental sub-surface	2	6	6	12.6	24
Ocean	1.2	1.2	1.2	2.5	5
Oceanic crust (~)	2	2	2	4.2	8
Sub-seafloor (~)	5	5	5	10.5	20
Total sub-surface/seafloor	7	11	11		
Total cells count	12.8	16.8	24.6	51.7	100
Biomass per cell (fg C)	21	21	21		
Biomass sub-surfaces GtC	**14.7**	**23.1**			
Biomass Gt C total	26.9	35.3	51.7		

Note soil microbes may be widely under-estimated, Blakemore (2018b) has ~

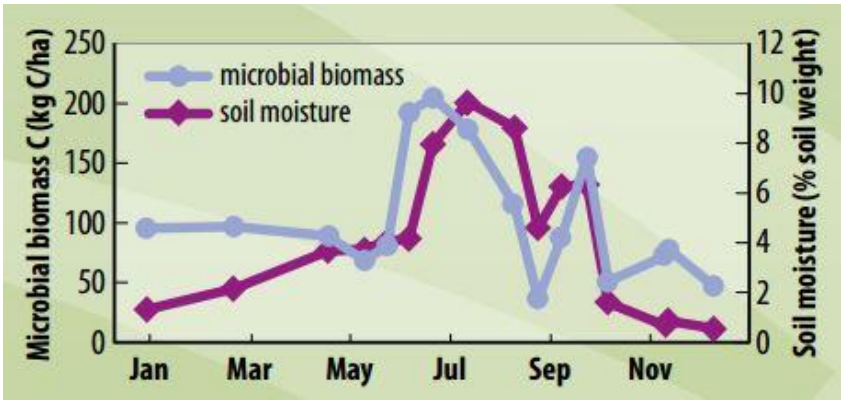
The median sub-surface biomass C count is 18.9 Gt C which is less than superficial biocrusts (5 Gt C x 4 from Blakemore 20-18 = ~20 Gt C) and less than Bar-On et al. (2018) estimate for the total biomass of soil microbes of ≈20 Gt C to about 0–8 m soil depth with about 98% in the top metre. This latter value is approximately quadrupled due to terrain and topsoil relief (20 x 4 =) 80 Gt C in global soil microbes that, plus biocrust of 20 Gt = 100 Gt soil and surface microbes that is much higher than any of the Deep Carbon biomass counts questioning their relevance.

However, the CoDL may not be a complete waste of money, time and effort, as drilling is important for prospecting geothermal potentials. The report by Magnabosco et al (2018) says: "*The average depths for the 85 °C and 122 °C isotherms were 3.2 km and 4.8 km, respectively. For the 122 °C isotherm, depths as shallow as 0.2 to 0.3 km were found in the Salton Sea trough of California and 0.1 km were found in southern Japan.*" This suggests average depth to 100 °C isotherm within range 3.2-4.8 km depth (much less in Japan), with median about 4 km deep!!!

If so, simplistically, then safe geothermal energy may be freely extractable in most places to a **depth up to 4 km**. This in itself is deserving of an thorough study as alternative to fossil fuels.

Studies of geothermal energy in some ways are in their infancy (sidelined by fossil fuel and the fissions research) but do have real potential for safe and limitless energy e.g. with Enhanced Geothermal Systems (EGS), HADES – hot and deep experimental systems, and not least with binary system. Some ongoing research is here - https://phys.org/news/2019-05-geothermal.html.

Soil microbial biomass varies considerably in a dynamic that appears most dependent upon soil moisture (and with surely link to temperature too)...



From http://soilquality.org.au/factsheets/microbial-biomass-carbon-nsw also links to soil temp.

Crusty crusts

Composed of fungi, lichens, cyanobacteria, bryophytes, and algae in varying proportions which live in intimate association in the uppermost few millimeters of the soil surface, and are the biological basis for the formation of soil cryptobiotic (= cryptgamic) crusts. E.g. *Microcoleus vaginatus* Gomont ex Gomont 1892 is one of the most common filamentous cyanobacterial species in the microbiotic crusts in the world. (https://www.ncbi.nlm.nih.gov/genome/?term=Microcoleus%20vaginatus). Estimates of total net carbon uptake by crusts globally are ~3.9 pg/year (2.1-7.4 pg/year).[7]

[This is 2.1-7.4 Gt/year which if quadrupled for terrain and topsoil = 8-28 Gt/yr!!].

Here is excellent report of cyanobacterial stains from Okinawa - https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5748578/ .

Nitrogen fixation has been recorded at rates of 0.7–100 kg/ha*year, from hot deserts in Australia to cold deserts.[8] Estimates of total biological nitrogen fixation are ~ 49 Tg/year (27-99 Tg/year).[7]

[This is just 0.049 Gt/yr (0.027-0.099 Gt/year) which seems terribly low even if upped by 4 times due to terrain. I think they need to consider the seasonal fluctuations of N in soil.]

Host environment Biomass (cells) fgC per cell Biomass (PgC) Depth interval Method and assumptions: Continental subsurface (Gold 1) 5 × 10 33 21 110,000 **0–5,000 m** Pore space occupancy model; 3% porosity, 1% occupancy of pore space: **I.E., 110,000 Gt C in soil microbes plus subsurface! ...** from Magnabosco, C., Lin, L.-H., Dong, H., Bomberg, M., Ghiorse, W., Stan-Lotter, H., … Onstott, T. C. (2018: tab. 1). The biomass and biodiversity of the continental subsurface. Nature Geoscience. doi:10.1038/s41561-018-0221-6.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4283042/. This paper summarizes my conclusions, however their data is deficient by at least 4 times !!

Aims of the rather vague but revitalized Green New Deal in USA in 2019 is partly political but from a supposed environmental concern basis, converges with some progressive ideas - https://www.organicconsumers.org/sites/default/files/green_new_deal_final.pdf but it too is limited in calling mainly for "*clean air, clean water*" while it mentions "soil" only twice. What this and most other earlier Green Deal reports (https://en.wikipedia.org/wiki/Green_New_Deal) miss is that if there is clean soil, then there is clean air and water and healthy food too thus ensuring mental, medical, social, and environmental health as well.

Bar-On et al. 2018 : "*For microbes (bacteria, archaea, fungi and protists), Recent studies estimate the microbial **biomass in litter** to be less than 1% of the total organic carbon mass in litter ([155–158]). This means that the amount of **microbial biomass in litter will not surpass 1 Gt C**, which is less than 10% of our estimate for the total biomass of soil microbes (see section on soil fungi and soil bacteria and archaea). Thus, the contribution from litter microbes will likely not affect dramatically our estimates for the total biomass of soil prokaryotes, protists or fungi*"

"*To estimate the total biomass of soil bacteria and archaea, we rely on the estimate of the total biomass of soil microbes we derived in the soil fungi section. We estimate a **total microbial biomass of 20 Gt C, of which ≈12 Gt C are fungal. This leaves us with ≈8 Gt C of bacterial and archaeal biomass***."...

That is a great point too!: deep microbial counts ignore the fungi that typically require surface fruiting bodies to spread their spores. How important are they? As Bar-On et al. say, maybe they represent 60% of total soil microbes. Another consideration is the microbial and fungal

spores and dormant structures that should also be included in the microbial inventories. These fluctuate greatly according to the season and soil moisture and temperature levels.

Soil faunal groups also support microbes in their guts, as per Whitman & Bar-On....

To make informed decisions then policy makers need correct and accurate data that is also in proportional perspective. For example, marine scientists often decry decline of a particular fish stock, but they fail to remark that fisheries and aquaculture in total supply less than 1% of human food. Thus decline of any particular fishery is highly irrelevant and distractive. In the context of carbon, the issue is not burning of fossil fuels, it is humus storage in topsoils. This is the greatest active global reservoir... and the most ignored. A soil C agendum? - https://www.nature.com/articles/s41893-018-0212-z.epdf?author_access_token=CzgxGWMW0kWONF9x7P3uFtRgN0jAjWel9jnR3ZoTv0Pg5DF7IGhylUYndWyr8OkDXon-VVNXHHx8hJtv-PMx_haLWcKhn2JxkPqzC_9ygdY7gWtaIav87lIsgkdjX9-xNsl21gYi3QY5YbMRZZAhJw%3D%3D .

Official view is that Natural Climate Solutions (NCS) can provide over one third of cost-effective climate mitigation alongside aggressive fossil fuel emission reductions (Ref - https://www.pnas.org/content/114/44/11645.full). This study is based upon IPCC (2014 - IPCC Working Group III (WGIII) (**6**)... This is IPCC (2014) lastest take on carbon cycle (see fig. 6.1) https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter06_FINAL.pdf ...

Checkit: word search for “ocean” – 787 hits; “marine” – 81 hits; “ sea “ – 50 hits:”water” – 141 hits; “aqua” – 9 hits (total 1,068); “ land ” – 482 hits; “terr” – 182 hits; “soil” – 166 hits (total 830); “atmospher” – 732 hits; “forest” – 192 hits; “humus” – 2 hits; “soil organic matter” – 1 hit; “compost” – zero; “worm” – zero. Yet again this suggests that ocean is more important than land whereas the converse is true. When IPCC undervalue soil and soil organic matter/humus it clearly indicates that there is such a strong anti-land bias that they can never produce meaningful base data nor effective means of solution. There needs to be a ‘sea change’ of views and perspectives if the global reality is to be properly represented. But this is to be expected as ther remit of IPCC Working Group I is “***The Physical Science Basis***” and they go on to mainly report the chemical or geophysical basis, almost ignoring the key biotic aspects. With this skewed view there can be no real resolve. Note: this report (Fig. 6.1) has atmospheric C at 830 Gt...

For soil organic carbon (SOC) they have (page 470): *“dead organic matter in litter and soils (1500 to 2400 PgC; Batjes, 1996). There is an additional amount of old soil carbon in wetland soils (300 to 700 PgC; Bridgham et al., 2006) and in permafrost soils (see Glossary) (~1700 PgC; Tarnocai et al., 2009); albeit some overlap with these two quantities.”* 1,500-2,400 in soils + ~1,700 in permafrost (totals 3,200 – 4,100 Gt C) plus possibly some of the 300 – 700 Gt C in wetland soils (totals up to 4,800 Gt C) but less about 60-80 Gt C in plant litter which is usually measured separately. This just shows how imprecise the soil measurements are compared to air or water. Soils are yet the Earth’s greatest mystery.

PHYTOMENON vs PHYTOPLANKTON

"Phytomenon" (as a new term for "plants" that abide) is appropriate for these terrestrial single-celled autotrophs, as opposed to the marine or aquatic phytoplankton ("plants" that drift). In the marine system these are composed of cyanobacteria, silica-encased diatoms, dinoflagellates, green algae, and chalk-coated coccolithophores (https://www.ncbi.nlm.nih.gov/pubmed/24311124). Information on the extent of the terrestrial menon is not readily available although, since land surface area has been quadrupled (https://www.mdpi.com/2571-8789/2/4/64), they may be substantial and possibly more numerous and productive than the plankton in the ocean. Ocean photosynthesis is especially limited by photons and nutrients.

Terrestrial phytomenon comprises phyto- and chemoautotrophs and includes photosynthetic cyanobacteria that play an important role in accumulating carbon and nitrogen in soil, especially dominant in deglaciated soils (Lie *et al.* 2016). As already noted above, here is an excellent report of cyanobacteria from Okinawa - https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5748578/. Brief summary report - http://www.downgardenservices.org.uk/bluegreenalgae.htm .

Total soil microbes from Bar-On "*Whitman arrived at an estimate of 26 Gt C for the soil prokaryote biomass... Xu et al. estimate the global biomass of soil microbes in the top 1 meter to be ≈23 Gt C... our best estimate for the total biomass of soil microbes is ≈20 Gt C. ... We estimate a total microbial [soil] biomass of 20 Gt C, of which ≈12 Gt C are fungal. This leaves us with ≈8 Gt C of bacterial and archaeal biomass*." But this must be wrong as total SOC is 8,500 Gt C, at least, and this may be about half microbial biomass. Back check from microbes per gramme and total soil mass to 1 m depth for counts and biomass? Anyway, for increased soil surface area (quadrupled) this value must itself be increased at least two to four fold up to (8 Gt x 4 =) 32 Gt C for soil bacteria. In addition there are soil algae & other photosynthetic biota.

Bar-On et al. (2017) estimates for the global aquatic picophytoplankton biomass converge at ≈0.4 Gt C; for diatoms a global biomass of is ≈0.3 Gt C. Other groups of protists, such as coccolithophores and foraminifera, were not included because their relative biomass contribution is an order of magnitude smaller. Summing up all the biomass contributions of photosynthetic organisms including seagrasses (≈0.1 Gt C), macroalgaea (≈0.1 Gt C), picoplankton (≈0.4 Gt C), diatoms (≈0.3 Gt C) and Phaeocystis (≈0.3 Gt C) produced an estimate of the total biomass of **total marine autotrophs of ≈1.3 Gt C** for all oceans.

Yuan et al. (2012) have photoautotrophic microbes comprised of CO2-fixing bacteria dominated by *Azospirillum lipoferum, Rhodopseudomonas palustris, Bradyrhizobium japonicum, Ralstonia eutropha*, and chromophytic algae of the genera *Xanthophyta* and *Bacillariophyta*. These produced a potential global sequestration of 0.6 to 4.9 Gt C year^{-1} based upon a surface area of 14 Gha. When this is at least doubled and approximately quadrupled for terrain and topsoil topography (Blakemore 2018b), then

these values are up to 2.4–10 Gt yr^{-1} and suggest a global C sequestration easily accounting for a "missing sink" for carbon of between 2 and 3 Gt C $year^{-1}$.

Moreover, when these organisms exit (abide?) on surfaces of plants and rocks, then their abundance is probably multiplied by the same order of magnitude. Thus land phytomenon productivity may be **in the order of 20 Gt C per year**. The cryptogamic biocrust itself has unknown productivity but its biomass is about 20 Gt.

Wiki fake information: "*Phytoplankton account for about half of all photosynthetic activity on Earth.[3][4][5] ...It is estimated that between 50% and 85% of the world's oxygen is produced via phytoplankton photosynthesis.[6][7][8][9][10] The rest is produced via photosynthesis on land by plants.[8]*" ... This is fake information as ocean photosynthesis is highly limited and there is more photosynthesis on land with its greater CO2, sunlight, abundant nutrients and greenery. Also, even if all photosynthesis stopped, there is sufficient O_2 in the air to allow all life to respire for the next 10,000 yrs! (This information from Duursma & Boisson 1994).

Bar-On et al. 2018 "arbuscular mycorrhizal fungi ... we estimate about ≈0.15 Gt C" and "our best estimate of the biomass of deep-sea planktonic fungi is ≈0.05 Gt C." https://www.pnas.org/content/pnas/suppl/2018/07/13/1711842115.DC1/1711842115.sapp.pdf ...total biomass of cyanobacteria at about ≈0.3 Gt C

Bar-On, for the bulk density of soil, use a global mean of ≈1.2 g cm-3 (from 9. Hengl T, et al. (2014) SoilGrids1km—global soil information based on automated mapping. PLoS One 9(8):e105992). Other sources have mean BD of about 1.3 g cm-3 which is what I used.

More fake info? Fallowski (1994 https://www.ncbi.nlm.nih.gov/pubmed/24311124) "*Phytoplankton biomass in the world's oceans amounts to only ~1-2% of the total global plant carbon, yet these organisms fix between 30 and 50 billion metric tons of carbon annually, which is about 40% of the total... calculations of net carbon uptake by the oceans resulting from phytoplankton photosynthesis suggest that without a supply of nutrients external to the ocean, carbon fixation in the open ocean is not presently a significant sink for excess atmospheric CO2.*"

Note: Blakemore (2018b) (https://www.mdpi.com/2571-8789/2/4/64), also doubled land NPP thus reducing the relative contribution of the world's oceans to about 10% of total NPP.

REGARDING NPP and HUMAN APPROPRIATION of NPP or HANPP.

Blakemore (2018b: tab. 11) mistakenly has NASA's land NPP total of "93" Gt instead of 63 Gt (and in their defence this is probably just for above ground vegetation ignoring soils); but anyway, this does not affect the base land average and total of 725.95 $gm^{-2}yr^{-1}$ and up to 170 Gt/yr that are here supported by Oechel in Goudie "*Global Change*" (2001: tab. 1) of 780 $gm^{-2}yr^{-1}$ and 117.5 Gt/yr that, with doubling for terrain, >235 Gt/yr on land. Q.E.D.:-

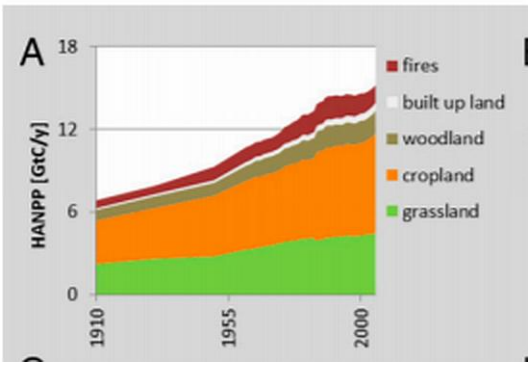
Biological Productivity. TABLE 1. Annual Net Primary Production, Leaf Area Index, and Chlorophyll Content of Biomes

TYPE OF VEGETATION	AREA (10^6 KM^2)	*Net Primary Production* RANGE (KG M^{-2}A^{-1})	*Net Primary Production* MEAN (KG M^{-2} A^{-1})	AREA TOTAL (10^{12} KG)	*Leaf Area Index* RANGE (M^2 M^{-2})	MOST FREQUENT VALUE (M^2 M^{-2})	CHLOROPHYLL CONCENTRATION MEAN (G M^{-2})
Continents	**149.0**		**0.78**	**117.5**		**4.3**	**1.5**
Tropical rainforests	17.0	1–3.5	2.2	37.4	6–16	8	3.0
Deciduous woodland (semiarid)	7.5	1.6–2.5	1.6	12.0		5	2.5
Deciduous forests (temperate)	7.0	0.4–2.5	1.2	8.4	3–12	5	2.0
Evergreen temperate	5.0	1–2.5	1.3	6.5	5–14	12	3.5
Boreal forests	12.0	0.2–1.5	0.8	9.6	7–15	12	3.0
Dry scrub and sclerophylls	8.5	0.3–1.5	0.7	6.0	4–12	4	1.6
Savanna	15.0	0.2–2	0.9	13.5	1–5	4	1.5
Meadows and steppes	9.0	0.2–1.5	0.6	5.4		3.6	1.3
Tundra	8.0	0.01–0.4	0.14	1.1	0.5–2.5	2	0.5
Shrub deserts	18.0	0.01–0.3	0.9	1.6		1	0.5
Dry and cold deserts	24.0	0–0.01	0.003	0.07		0.05	0.02
Agricultural crops	14.0	0.1–4	0.65	9.1	4–12	4	1.5
Swamps, marshes	2.0	1–6	0.3	6.0		7	3.0
Inland waters	2.0	0.1–1.5	0.4	0.8			0.2
Oceans	**361.0**		**0.155**	**55.0**			**0.05**
Open ocean	332.0	0.002–0.4	0.125	41.5			0.03
Upwelling zones	0.4	0.41–1	0.5	0.2			0.3
Coastal zones	26.6	0.2–0.6	0.36	9.6			0.2
Reefs and tidal zones	0.6	0.5–4	2.5	1.6			2.0
Brackish water	1.4	0.2–4	1.5	2.1			1.0
Global total (Earth)	**510**		**0.336**	**172.5**			**0.48**

SOURCE: Whittaker and Likens (1975); for details see Ajtay et al. (1979); Schulze (1982).

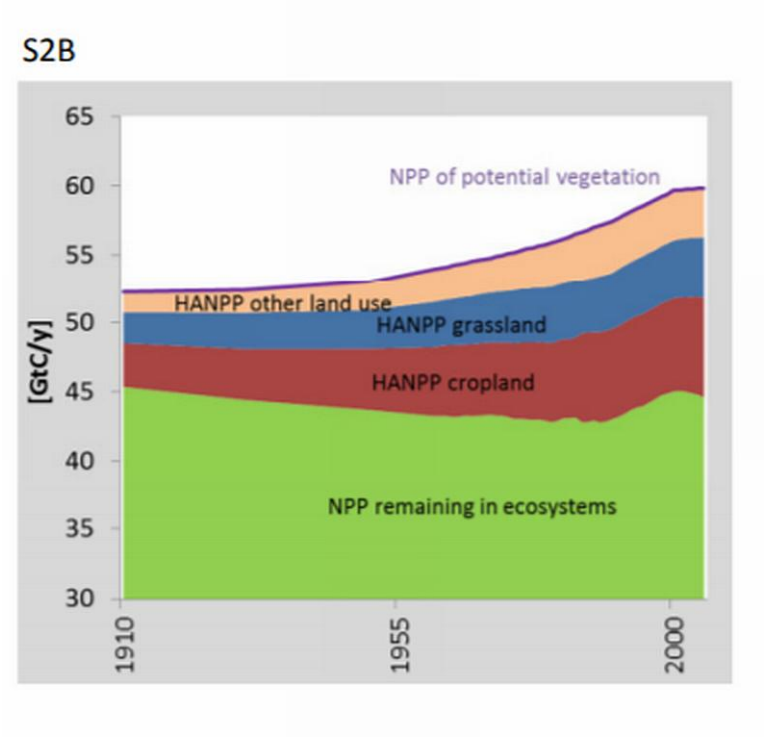
If total revised NPP allowing for terrain is about 270 Gt C per year as per Blakemore (2018: tab. 11) then land provides at least (270-50 =) 220 Gt C and also may have more superficial phytomenon than there is marine phytoplankton. Note the table has mean LAI for biomes of 4.3.

Krausmann et al. (2013 https://www.pnas.org/content/pnas/110/25/10324.full.pdf) estimated Human Appropriation of NPP (HANPP) rose from 6.9 Gt of carbon per yr in 1910 to 14.8 GtC/yr in 2005, i.e., from 13% to 25% of the net primary production of potential vegetation. This includes cropland, grassland, woodland, fires and built-up land (see their fig. 1A copied below). From my >218 Gt/yr NPP, their 14.8 Gt/yr is, at best, about 6.6%. This rightly ignores oceans...

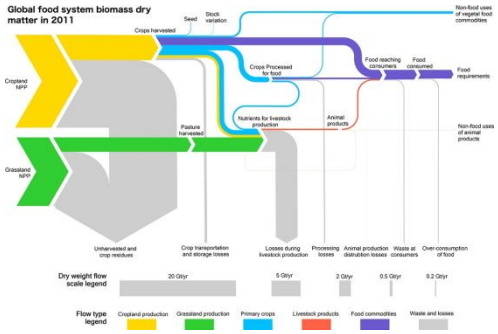


Note: these authors have a NPP of about 60 Gt C/yr (as shown in their fig. S2B copied below www.pnas.org/content/pnas/suppl/2013/05/31/1211349110.DCSupplemental/sapp.pdf); this I disagree with because (as well as ignoring below ground NPP which is about the same i.e., 60

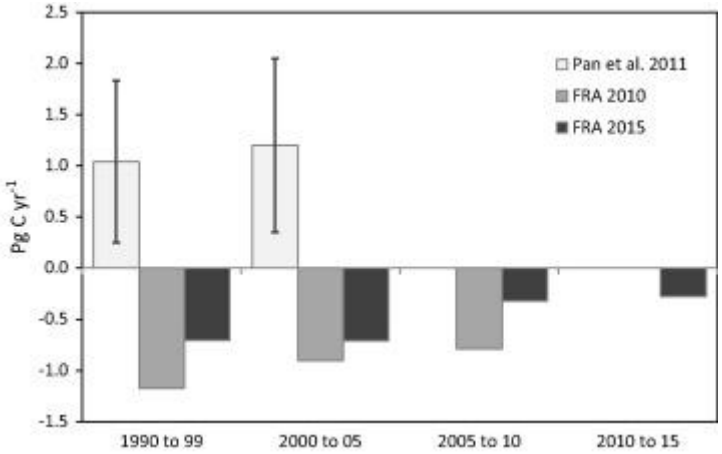
Gt/yr) they need to update to include terrain to give NPP of >218 Gt/yr from my 2018 study. Thus humans appropriate only a quarter of the 25% they claim, viz. just ~6% HANPP. Q.E.D.



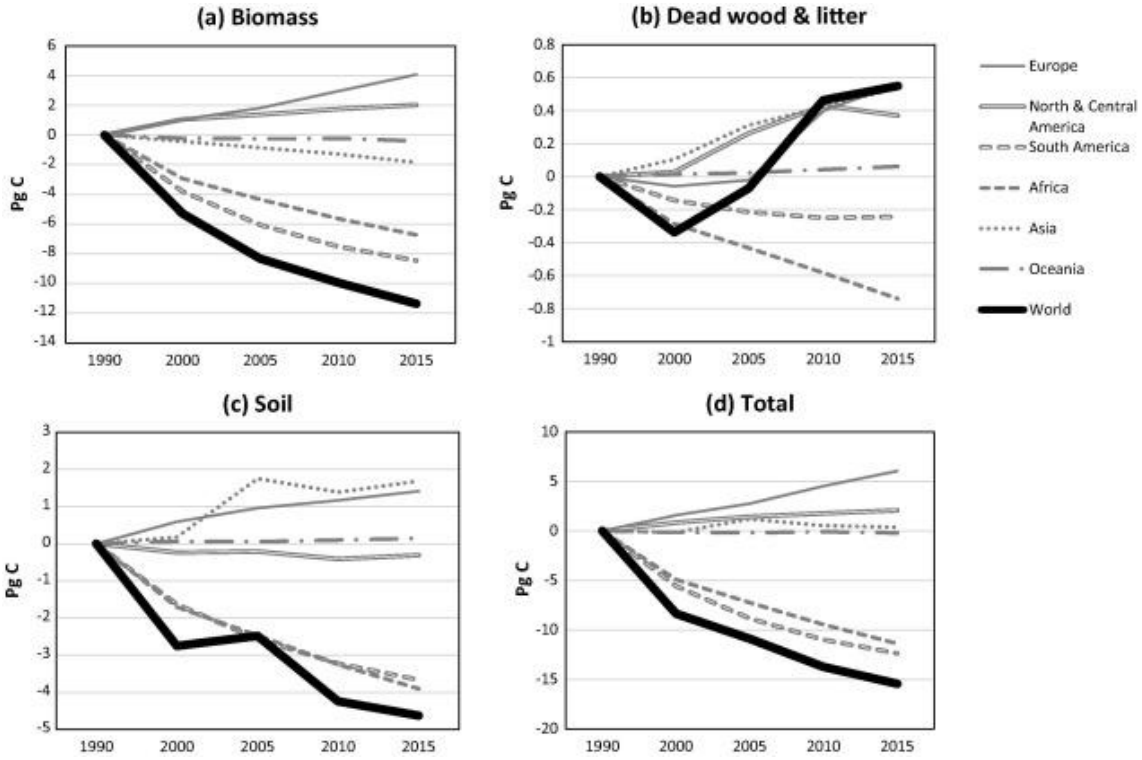
Other studies of human appropriation have global NPP values of 8.0 Gt C/yr for cropland and 5.9 GtC/yr for grassland (Alexander et al. 2017; Ito & Oikawa, 2004), total 13.9 Gt C; however, only a fraction of this is removed from the land and actually utilized as food.



Forests provide the largest proportion of Earth's NPP and Kohl et al. (2015 - https://www.sciencedirect.com/science/article/pii/S037811271500314X) claim global wood removals in 2005 totaled 3.0×10^9 m^3, which amounts to roughly 0.3 Gt C $year^{-1}$. which is a relatively tiny proportion. However, their figs. 6 & 7 actually show that about half again is global woodfuel removal and thus total removal would be about 0.45 Gt C $^{-1}$ for all timber products. Their fig. 16 counter-intuitively shows the global forest ecosystems being a net source of carbon due to such "stock changes" (based on UN's FAO five-yearly Forest Resource Assessments or global FRAs).



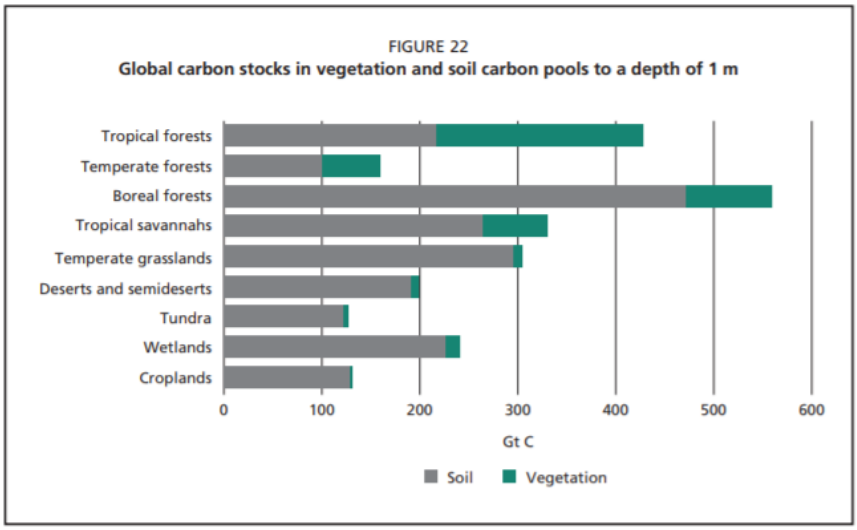
However this is partly offset by their fig. 4b of dead wood and leaf litter accumulation that peaks at about the same 0.6 Gt C in 2015 compared to 1990 figures. Note that in fig. 4 c soil is the largest loss of carbon estimated at about 5 Gt C in 2015 from forest soils over that period.



https://www.sciencedirect.com/science/article/pii/S037811271500314X

The FAO source (global FRA 2015 http://www.fao.org/3/a-i4793e.pdf) states: "*The bulk of the world's forests is natural forest, with reported natural forest area amounting to 93 percent of global forest area, or 3.7 billion ha, in 2015. From 2010 to 2015, reported natural forest area decreased by a net 6.5 million ha per year. This is a reduction in net annual natural forest loss from 10.6 million ha per year for the period 1990 to 2000*." In contrast, it is estimated that, in 2000, 34% of the Earth's ice-free land area (12% cropland; 22% pasture) was devoted to

human agriculture and much of this land has replaced forests, savannas, and grasslands [https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2007GB002952]. Although these figures were based upon "*at 5 min (~10 km) spatial resolution*", thus upon an unrealistic "flat-Earth" premise, the actual planimetric percentages would be roughly representative. Total global "HANPP" (Human Appropriation of Net Primary Production) is estimated to be about to 23.8% of *potential vegetation* (NPP_0)[29] although this does not mesh with the chart by Alexander et al. 2017 showing only a fraction of this being actually consumed and most left as residue on the fields. Returning again to the importance of soil and soil organic matter, the chart below shows how – despite what ocean or forestry advocates claim – the overwhelming global bulk of soil carbon is stored below ground in humus: mainly in its living, dormant and deceased microbes (source UN's FAO from IPCC 2000):



Source: Data from IPCC, 2000

This fig from FAO http://www.fao.org/3/a-i5857e.pdf shows, firstly, that forests are not the solution rather that soils are and, secondly, even forest soils only store less than half soil C, about 39%. Moreover, these total values are likely more than doubled due to neglected terrain raising soil carbon they estimate as 2,000 Gt to >4,000 Gt at least or estimated by Blakemore (2018) as 8,580 Gt global soil carbon.

DOES PERMAFROST NEED TO BE ADDED TO SOIL CARBON?? No! It's already there...

Permafrost soils (cryosols) occupy nearly 9% of the Earth's flat land area storing 25–50% of the soil organic carbon. Global warming impact of the data from Kochy *et al.* (2015: 361) of approximately 1,700 Gt (actually 1,672 Gt) of soil carbon in the cryosols of the northern circumpolar permafrost zone is considered by Shurr et al. 2013 https://link.springer.com/article/10.1007/s10584-013-0730-7. A 2019 paper shows that N_2O is also emitted by permafrosts - https://www.sciencedaily.com/releases/2019/04/190415090848.htm . Melting permafrost is even threatening Norway's Domesday seed vault (e.g. www.telegraph.co.uk/news/2019/03/28/doomsday-vault-threatened-climate-change/). This

serious situation requires urgent consideration for "tipping points" - www.nature.com/articles/d41586-019-01313-4?utm_source=twt_nnc&utm_medium=social&utm_campaign=briefingthread. On 2nd May, 2019 I called out the lead author (Merritt Turetsky mrt@uoguelph.ca) of this paper as all her calculations (total 1,600 Gt permafrost C) are planimetric, ignoring terrain and relief, so all are wrong. She said the data was good because arrogant "experts" had told her so! Even my dog knows that hills are hilly!! And yes, I realize that terrain attenuates at depth, even so, the terrain is not flat so any data on that assumption is false. Cf. Blakemore (2018: fig. A3), scale dependent, there are at least three levels of terrain/turgosity; depth of soil is affected by at least the first two, and the superficial upper layers by the third multiplication factor.

Confirmed: "*Rob - Interesting paper; these estimates for permafrost C pool likely use the standard approach for land area. Best, Ted*"Ted Schuur, Ph.D. Professor of Ecosystem Ecology. Email Sat, 4 May

COMPOSTABLE WASTES

Global food production: Lal (2001: tab. IX) has approximately these figures for 1995 net totals:

Cereals 1,996, soybeans 126, Pulses 56, Roots & tubers 609 to total 2,687 Mt/yr.

This I think is DM, so carbon content would be about half so about 1.35 Gt C. I think I saw that pastures produce about the same biomass each year, if so then also about 1 Gt. Total = 2.35 Gt.

(He also says an additional ~32% is estimated as production loss due to soil erosion each yr).

Anyway, if about half food is wasted, then about 1 Gt could be composted. In addition is animal manures (1 Gt?) and the roots and crop residues already left in the fields (1–2 Gt).

Every year there is "yard waste" and lawn clippings and tree punings, etc. all these could be added to compost rather than burned or dumped. Also paper, seaweeds, etc. Another 1 Gt?

My point? There could easily be a supply of 2–4 Gt of compostable food wastes, manures and other organics to recycle. This is broad brush, but local scale is suitable.

Note: Lal 2010 "Beyond Copanhagen" says that C sequestration in soils can be in order of:

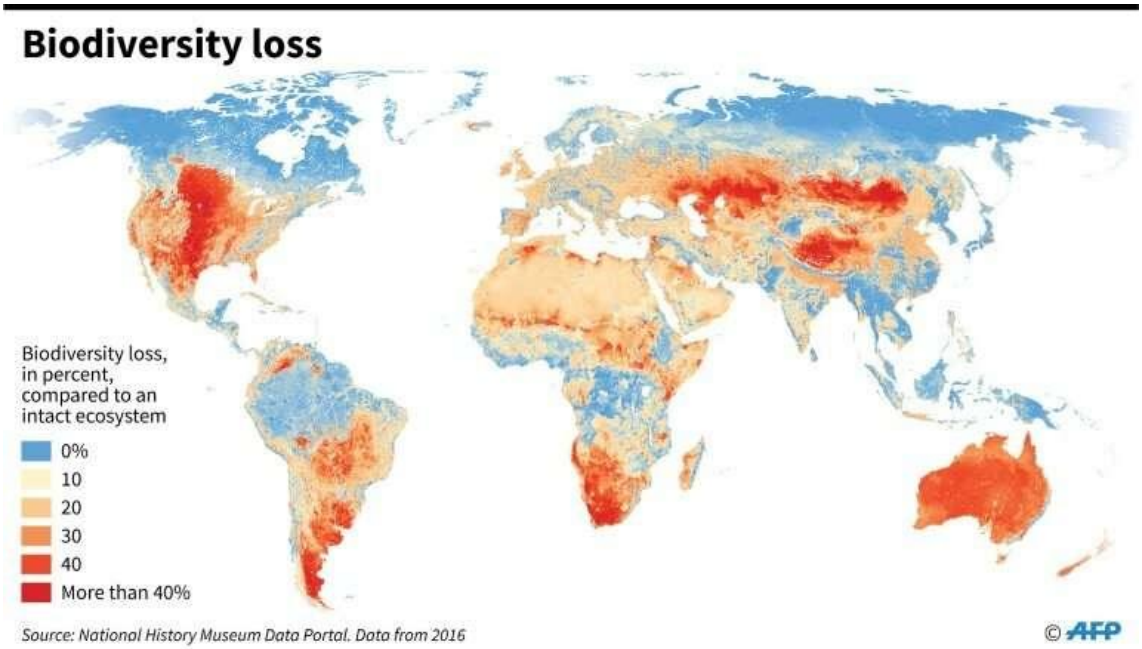
1 Gt Croplands ; 1 Gt Grasslands; 1 Gt Restoration of salt affected soils; 0.5 Gt Control desertification. **TOTAL 1.8 – 4.4 Gt Carbon/yr.** This is not allowing for extra topsoil calculations from Blakemore (2018b) that were, however, included by Lal (2019).

Regarding Carbon Capture & Storage (CCS) – only photosynthesis and SOC is realistic.

Highly oversponsored schemes for artificial, mechanical or technological CCS are again shown to be irrelevant but hugely expensive tokenisms which is to be expected from chemists/physicists/engineers/marketeers with no ecological ken.

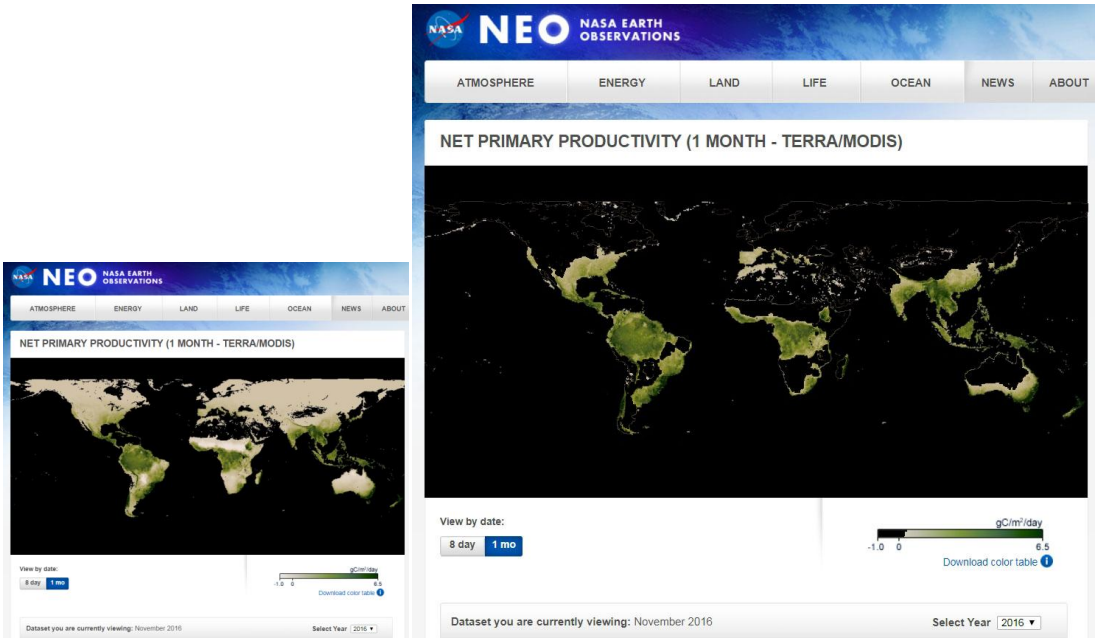
BIODIVERSITY

The draft IPBES (2019) report shows the Earth in the grip of a most critical extinction event – see https://phys.org/news/2019-04-million-species-extinction-due-humans.html?utm_source=nwletter&utm_medium=email&utm_campaign=daily-nwletter .



UN FAO's (2019) report on Biodiversity in Agriculture is a step in the right direction, but it too suffers from an aquatic imbalance. To remind, the ocean provides just 0.5% of human food, supports just about 2% of global biodiversity and only 0.2% of global biomass. Lakes and rivers have less than 1% biodiversity. This report for "aqua" has 737 hits, "marine" – 225, "ocean" – 87, "sea " – 48, "water" – 679, "fish" – 1,005 to total about 2,000 wet hits; compared to "soil" with 748 hits, " land" – 773, " ground " – 12, "earthworm" – 26, "compost" – 33, " organic " – 213 to give dry total a bit less than 2,000. The point being that ocean only provides 0.5% of food and supports just 2% of biodiversity so should only be about 2% of the issue! [It should again be stressed that soil filters 100% of drinking water and that the main poisons in water are from non-organic farming on land]. Their fig. 4.6 shows threats to soil biodiversity in most of the habitable areas of Earth and this is the greatest global threat. Finally, this report missed the two key studies by Blakemore (2018a https://www.mdpi.com/2571-8789/2/2/33 , b https://www.mdpi.com/2571-8789/2/4/64).

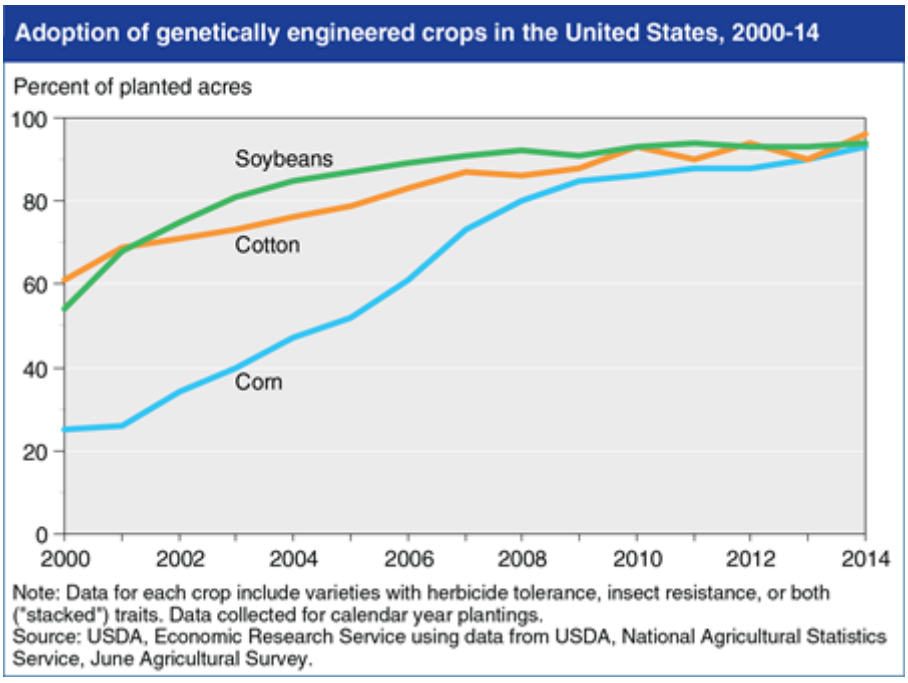
Regarding NPP, globally much is dark and only a bit green:::



modified from https://neo.sci.gsfc.nasa.gov/view.php?datasetId=MOD17A2_M_PSN

Global loss of insects by 80% https://phys.org/news/2019-02-world-catastrophic-collapse-insects.html?utm_source=nwletter&utm_medium=email&utm_campaign=weekly-nwletter

What !: "Moles, hedgehogs, anteaters, lizards, amphibians, most bats, many birds and fish all feed on insects or depend on them for rearing their offspring. Read more at: https://phys.org/news/2019-02-world-catastrophic-collapse-insects.html#jCp "



Apply Global Topsoil for UNESCO World Heritage:::

To be included on the World Heritage List, sites must be of outstanding universal value and meet at least one out of ten selection criteria. Topsoil, the top 5 cm of global soil is the major natural heritage that has provided food and filtered water for all humanity from the beginning of time. It is of outstanding universal value from the aesthetic and scientific point of view that is the major habitat of threatened species of animals and plants of outstanding universal value from the point of view of science, conservation or natural beauty.

It meets the Selection Criteria of:

i. it bears a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared (due to topsoil covering most archaeological sites);

ii. to contain superlative natural phenomena (biodiversity) or areas of exceptional natural beauty and aesthetic importance;

iii. to be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;

iv. to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems (the latter three due to soil run-off from land) and communities of plants and animals;

v. to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation (e.g. earthworms that seem particularly vulnerable to the abuse, poisoning and erosion of limited topsoils).
The protection, management, authenticity and integrity of properties are also important considerations.

Really? This is the best these bureaucrats can come up with?:::

Kirschbaum et al. 2019 **Towards a more complete quantification of the global carbon cycle**
https://www.biogeosciences.net/16/831/2019/?utm_campaign=Carbon%20Brief%20Daily%20Briefing&utm_medium=email&utm_source=Revue%20newsletter

"12.3 Blue carbon

It has been recognised that **mangrove forests, seagrass beds, and salt marshes** can sequester large amounts of carbon, recently termed "blue carbon" (McLeod et al., 2011; Huxham et al., 2018). **It has been estimated to constitute a global carbon sink of at least 200 MtC yr^{-1}** (McLeod et al., 2011) or even more (Breithaupt et al., 2012). However, infrastructure development of coastal habitats not only prevents ongoing carbon sequestration by these ecosystems but can also lead to the release of the large carbon stocks of these systems. Overall, such development may result in comparable annual carbon losses as the ongoing sequestration by intact systems (e.g. Pendleton et al., 2012; Regnier et al., 2013; Atwood et al., 2017). SOIL IS ABOUT 8,580 GT!

THIS JUST SHOWS HOW BLUE CARBON IS A TRIVIAL (just 0.2 Gt) AND IRRELEVANT DISTRACTION

12.4 Soil organic carbon

There may also be changes in soil carbon that can be very difficult to detect. Globally, there are about **2500 GtC in soil organic matter to a depth of 2 m** (Batjes, 2004) so that a change by just 0.4 % yr^{-1} would equate to a flux of **10 GtC yr^{-1} to or from the atmosphere** (Minasny et al., 2017). Such a change could be readily associated with land-use changes (e.g. Guo and Gifford, 2002; Kim and Kirschbaum, 2015). They may also correspond to episodic changes within given land uses, especially changes related to accelerated erosion under agricultural land use (e.g. van Oost et al., 2007; Quinton et al., 2010; de Rose, 2013). SOIL IS ABOUT 8,580 GT!

Observational verification of annual changes of the order of 0.4 % yr^{-1} is extremely difficult owing to the many important factors that may positively or negatively affect soil carbon levels under different circumstances and over different timescales (e.g. Schipper et al., 2017). However, even such proportionately small changes could be very important in the global budget and have become the basis of the recent *4 per mille* initiative (e.g. Minasny et al., 2017) which aims to promote land-use practices to increase soil carbon by that amount.

Globally, there are about 2500 GtC in soil organic matter to a depth of 2 m (Batjes, 2004) so that a change by just 0.4 % yr^{-1} would equate to a flux of **10 GtC yr^{-1} to or from the atmosphere** (Minasny et al., 2017).

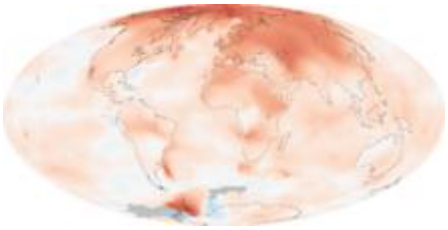
THIS JUST SHOWS HOW THEIR DATA IS INADEQUATE – SOC is at least 8,500 Gt C so that a change by just 0.4% yr-1 would be a flux of at least 34 Gt C per year which would exceed excess CO2 emission by three times, or completely offset emissions whilst simultaneously reducing excess atmospheric CO2 to the desired levels within a few years. The way to achieve this extra 0.4% SOC is to keep all land covered with greenery for more photosynthesis, to reduce all un-necessary burning of crop residues or timber "wastes" and, most importantly, to vermi-compost all organic matter and return it to the soil.

THE OCEAN LIES STILL…

The only honest fact I have found about the Oceans is that water is wet (except for ice) and that fish live in it (except for mud skippers and flying fish/squid). Most other is propaganda. **https://www.unenvironment.org/explore-topics/sustainable-development-goals/why-do-sustainable-development-goals-matter/goal-14 Data and Statistics / Facts and Figures:**

- Oceans cover three quarters of the Earth's surface, contain 97 per cent of the Earth's water, and represent 99 per cent of the living space on the planet by volume

- Over three billion people depend on marine and coastal biodiversity for their livelihoods
- Globally, the market value of marine and coastal resources and industries is estimated at $3 trillion per year or about 5 per cent of global GDP
- Oceans absorb about 30 per cent of carbon dioxide produced by humans, buffering the impacts of global warming
- Oceans serve as the world's largest source of protein, with more than 3 billion people depending on the oceans as their primary source of protein
- Marine fisheries directly or indirectly employ over 200 million people



This graphic shows that land is heating more than oceans. Also soil has much more plastic pollution and is becoming acidic twice as severely and about 100 times as rapidly. The ocean lies still...

IUCN fake info – "Our mandate covers the most pressing issues of global governance with respect to the largest resource on Earth: the World Ocean" https://www.iucn.org/commissions/world-commission-environmental-law/our-work/oceans-coasts-and-coral-reefs but the reefs may not even be endangered - https://wattsupwiththat.com/2018/02/08/peter-ridd-hits-back-at-jcu-james-cook-university-hard/ ; https://platogbr.files.wordpress.com/2018/02/ridd-p-chapter-1-from-climate-change-the-facts-2017-ipa.pdf

What issues are being under-played?

- Topsoil is being lost 10 to 40 times faster than it is being replenished by natural processes
- Since the mid-20th Century, 30% of the world's arable land has become unproductive due to erosion
- 95% of the **Earth's land areas could become degraded** by 2050
-

The thickness of an average credit card equals 10 tons of top soil per ha and the loss of this 25 mm of soil by wind, water or agrichemical erosion will take 500 - 1000 years to restore.

SOIL EROSION

Note: IPCC (2013: fig. 6.1) shows 1.7 Gt "Exported from soil to rivers", but then shows 0.9 taken to ocean and 1.0 outgassed and 0.2 buried in lakes (total 2.1 Gt!!). Also their source, cited on text pg 471 as Tranvik et al., 2009 - https://aslopubs.onlinelibrary.wiley.com/doi/epdf/10.4319/lo.2009.54.6_part_2.2298 on page 2310 has organic C "imported to inland waters from the terrestrial environment" of ~2.9 Gt/yr!

Lal (2001: 535) on historic loss of C due to past erosion has these notes: "*as much as 1.14 Pg C may be emitted into the atmosphere due to water erosion... annual C loss due to desertification of drylands at a rate of 0.2–0.9 Pg C yr-1... 21 Pg has been lost due to water erosion and 4 Pg due to wind erosion (Table X)*". This total of 25 Gt C lost provides a reference point with regard to the potential of C sequestration through erosion control and restoration of degraded soils. He assumed that 60–75 % of the historic C lost can be recovered through adoption of soil restorative tecvhniques.

Lal (2001: 536) also says: "*Erosion-induced changes in soil C dynamics are complex and not very well understood. An important factor affecting soil C dynamics is the activity and species* ***diversity of soil fauna which influence microbial processes****. Microbial processes affect humification, aggregation, and minralization. Effects of erosion/deposition cycles on these processes need to be studied*." Perhaps the most important soil fauna are earthworms?!

These matters are close to home for British politicians, the authors argue, with the average population sizes of the most threatened species in the UK having **decreased by two-thirds since 1970**.
The UK is described as **one of the most nature-depleted countries** in the world. Some 2.2 million tonnes of **UK topsoil is eroded annually**, and over 17% of arable land shows signs of erosion. https://www.bbc.com/news/science-environment-47308235

For FERN Ag perhaps on nitrogen and nutrients since Rockstrom says cut by 50% immediately.

Soil N upped by non-flat Earth, leaf litter and ews too!!

https://www.bbc.com/news/science-environment-47203344

"This ecological collapse theory, which has been the subject of **bestselling books**, points to excessive deforestation, water pollution, soil degradation and the loss of biodiversity as precipitating causes these plus climate change are mainly due to chemical agriculture."

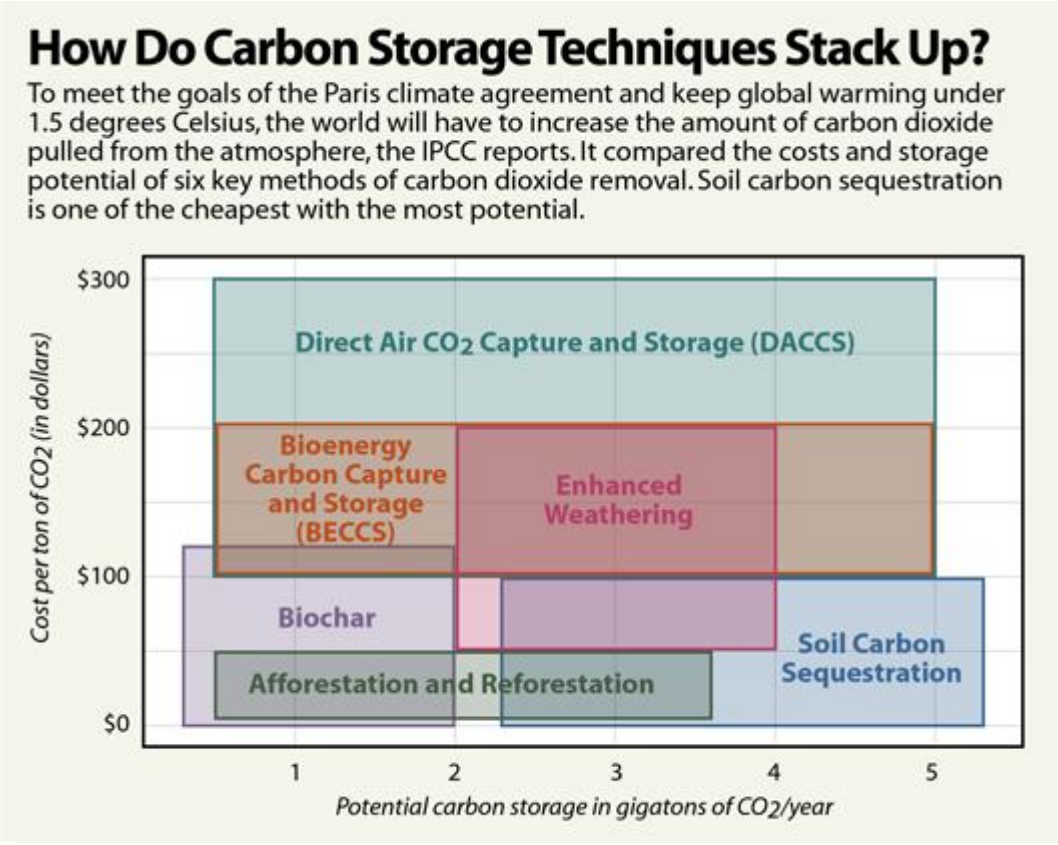
French president Emmanuel Macron writes: "Getting back on track also means spearheading the environmental cause. Will we be able to look our children in the eye if we do not also clear our climate debt? The EU needs to set its target – zero carbon by 2050 and **pesticides halved by 2025** – and adapt its policies accordingly with such measures as a European Climate Bank to finance the ecological transition...

The weight of evidence of a fact does not depend on the number of witnesses who testify to that fact.

Australian government knee-jerk reaction is to pump $500 m into GBR and another $42 m into yet another ridiculous dung-beetle project, with CSIRO still promoting dangerous and ineffective GMO, while there is yet no Soil Ecology Institute nor funding for organic/earthworms that together offer hope. Perhaps when their house is on fire (or flooded) in Canberra (which actually happened in 2003) they will realize that this token displacement behaviour is both wasteful and shameful. Ignorance is no defence, as in law.

Keep Global Warming Under 1.5°C, Emissions Must Go Negative, IPCC Says: Soil leads the solutions for negative emissions in a new climate change report. Soil carbon sequestration was among the cheapest methods with the greatest potential. Sabrina Shankman OCT 12, 2018

https://insideclimatenews.org/news/12102018/global-warming-solutions-negative-emissions-carbon-capture-technology-ipcc-climate-change-report


How Do Carbon Storage Techniques Stack Up?
To meet the goals of the Paris climate agreement and keep global warming under 1.5 degrees Celsius, the world will have to increase the amount of carbon dioxide pulled from the atmosphere, the IPCC reports. It compared the costs and storage potential of six key methods of carbon dioxide removal. Soil carbon sequestration is one of the cheapest with the most potential.
$300
$200
$100
$0
Cost per ton of CO2 (in dollars)
Direct Air CO2 Capture and Storage (DACCS)
Bioenergy Carbon Capture and Storage (BECCS)
Enhanced Weathering
Biochar
Soil Carbon Sequestration
Afforestation and Reforestation
1
2
3
4
5
Potential carbon storage in gigatons of CO2/year
SOURCE: IPCC
InsideClimate News

IT IS RIDICULOUS THAT THEY EVEN CONSIDER THE BIOCHARLATANS – they offer nothing over tried and true compost that is natural and beneficial and.... free. All organic farming options are essentially free too, once subsidies are removed from chemical farming. Of course must pay farmers and they have costs, but there follow on benefits of organic are expressed in less pollution and much lower health costs. Plus, without the physical and mental diseases caused by toxic agrichemicals (especially to farmers and their families!), then reasonable people can

make healthier decisions and start to see through the lies and chemical corruption. Nature will educate, one way or another...

Another useless study: https://advances.sciencemag.org/content/5/4/eaaw2869 A Global Deal For Nature: Guiding principles, milestones, and targets. Dinerstein *et al*. 2019.

Searches: "soil" – 6; "organic" – 0; "agriculture" – 4; "**ocean" or "marine" – 75; "water" – 27**; "Fish" – 24; "humus" – 0. "worm" – 0...

Howard (1945 Intro to Darwin's book reprinting http://journeytoforever.org/farm_library/oliver/howard_intro.html): "*There is a growing volume of evidence from all over the world that agriculture took the wrong road when artificial manures were introduced to stimulate crop production and when poison sprays became common to check insect and fungous pests. Both these agencies destroy the earthworm and thus deprive the farmer of an important member of his unpaid labour force. There is also a strong case for believing that one of the roots of present-day disease in crops, livestock, and mankind can be traced to an impoverished soil and that these troubles are aggravated by the use of chemical manures.*

The publication of the evidence which indicates that all is not well in our farming and gardening has very naturally disturbed the advocates of chemical farming. What has been described as the war in the soil has broken out and is now in full swing. The most effective way for all concerned of conducting this contest will be to pose to Mother Earth herself the question: What is your decision in this battle between organic and inorganic manuring? When this decision has been duly given, it will have to be interpreted. Live stock can be relied upon to say that the grain, fodder and forage raised with humus is far superior to that obtained with the help of chemicals. The earthworms will unhesitatingly plump for organic manuring. We can read their message by a simple count and by observing their general condition and activities.

There is no better soil analyst than the lowly earthworm..."

HEALTH

Cancer rates from Rachel Carson (1962) were 1 in 4, now >1 in 2 and US cancer society says 95% are environmental. Many farm chemicals are now banned as being carcinogenic or environmental POPs. Also ozone layer is a chemical problem exacerbating skin cancers. See VermEcology study - vermecology.wordpress.com/2018/05/27/wormageddon-destruction-in-our-soils/:

"Cancer rates in USA at 530.7 new cases per 100,000 people per year in 2018 are now the World's new high and chances of cancer in your lifetime are >1 in 2. Clarifying: "***The lifetime risk of cancer for people born since 1960 is >50%. Over half of people who are currently adults under the age of 65 years will be diagnosed with cancer at some point in their lifetime***" (Ref.). And not just older people, in USA it is the leading cause of death by disease of children & adolescents 0-19 years and now, each year (Ref.), based upon % of total population from 2014 census data, rates are:-

- 16 cancer diagnoses per 100,000 children ages 0 to 14 years (19.5%)
- 71 per 100,000 adolescents & young adults ages 15 to 39 years (33.5%)
- 962 per 100,000 people aged 40 years or older (47%) [or *ca*. 1 in 100]

From my math(s) (Ref.), that totals ~**480 new cases per 100,000** per year in 2010-2014, just above 454.8 in 2008-2012 (Ref.). But the latest total new cancer cases for 2018 are estimated as 1,735,350 which, in a US population of *ca*. 327 million, gives a steady increase to **530.7 per 100,000 –** a new world record, and an estimated 609,640 people will die. Another 5 million will have newly diagnosed skin cancer (which puts the USA total new cancer rate in 2018 at 2,060 per 100,000 people!). According to the National Cancer Institute(https://seer.cancer.gov June, 2018) causes are just 5% genetic, so 95% are due to chemical pollution and/or lifestyle (cf. Ref., Ref.).

This is big, BIG business for the pharmaceutical=agrichemical (Pharm/Farm) companies… "Agricancer"! They are literally making a killing. Think of your best friend/a family member/the person next to you – either you or them (or both!) will, according to the laws of average, get cancer. Contrast Cuba where due to good fortune of Soviet collapse & continued US embargo, agriculture relies upon vermicompost & organic husbandry [husbandry is having stock as well as crops, and includes earthworms as stock! but actually Cuba may not be doing so well if it really imports 70% of its food to a subtropical island... https://www.bbc.com/news/world-latin-america-48237319] (e.g. *orgaponicos*) rather than synthetic chemical fertilizers & pesticides. [It may be noted that urban allotments in UK also have 32% higher organic humus SOC and yields 4–11 times above their conventional chemical agriculture neighbours (Ref., Ref.)]. Feeding themselves completely adequately, residual cancer rate in Cuba is 47th out of 50 countries at 218 per 100,000 (www.wcrf.org/int/cancer-facts-figures/data-cancer-frequency-country), or less than ½ to one-tenth that of the USA. Check out too how meat-lovers' Australia or Korea are near the top yet culturally fish-eating Japan is near the bottom of this cancerous Butcher's-List. [Fukushima may change this, but that is another story…].

An ounce of prevention is worth a pound of tumor (apologies to Ben Franklin).

The following three graphics summarize correlation between CAFO meat vs. Cancer (Ref., Ref.). Note: Carnivorous Australia tops both, whilst vegetarian India fares far better and fish-favouring Japan is mid-way, somewhere in between:-"

In Japan I have seen new cancer hospitals opening and, just this week (April 2019) a new **children's cancer** hospital is opening in London (www.uclh.nhs.uk/aboutus/newdev/ncf/Pages/Home.aspx). Is it not strange to even talk about children's cancer? Why are only the symptoms and results being treated? What is the cause? "According to the Mayo Clinic, today, after four decades or more pervasive use of glyphosate pesticides, 100 million, or 1 out of 3 Americans now have liver disease. These diagnoses are in some as young as 8 years old." The response of the pharma-chemical industry it not to stop pollution, but to make more drugs available or to transplant livers. More sensible studies suggest changing diet, environment and lifestyle - https://www.journal-of-hepatology.eu/article/S0168-8278(18)32517-0/fulltext. And avoiding Roundup/Glyphosate, now also associated with liver disease (Mills et al. 2019 supporting earlier finding in rats by Mesnage et al. 2017).

Nitrates in water in NZ - https://theconversation.com/drinking-water-study-raises-health-concerns-for-new-zealanders-108510. There is also the Cd scandal in NZ soils from fertilizers, as with Rothamsted soils (Blakemore 2018: tab. 12 www.mdpi.com/2571-8789/2/2/33).

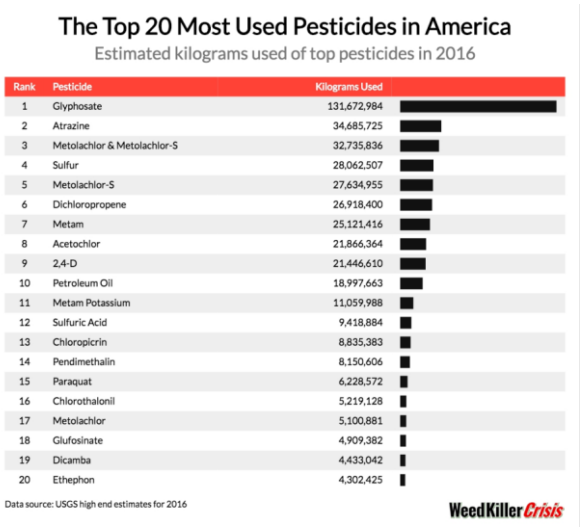
Rockstrom advocated immediate 50% reduction in synthetic nitrogen fertilizers but offered no realistic means to deliver such a broad program and failed to consider the organic alternatives.

Long recognized that soil health, crop health and human health are all interlinked (Howard, Balfour). In contrast, ex-Monsanto's ex-CEO Shapiro aimed to link these three aspects but only to make profit in their business model to control food, farming and health.

In the meantime, they pay for shills: "may have to divorce Monsanto from direct association with the expert or we will waste the $1,000/day these guys are charging." – Monsanto nice guys!!

Daniel A. Goldstein (DAG) who ignored plea for help from Lee Johnston and was also instrumental in the attack on Seralini's GMO/Roundup rat research (https://usrtk.org/wp-content/uploads/bsk-pdf-manager/2019/03/Plaintiffs-exhibit-Monsanto-internal-email-string-celebrating-Seralini-attack.pdf ; https://usrtk.org/wp-content/uploads/bsk-pdf-manager/2019/03/Plaintiffs-exhibit-Monsanto-email-re-Seralini-and-actions.pdf). All this early October 2012.

"Well, I absolutely think that Roundup is capable of causing NHL in humans in the way it has been used." 20th Feb, 2019....



Trial in 2019 unanimously finds glyphosate (Roundup) a causal factor in non-Hodgkins lymphoma (NHL) cancer (https://usrtk.org/monsanto-roundup-trial-tracker/in-blow-to-bayer-jury-finds-roundup-caused-plaintiffs-cancer/); this was supported in concurrent papers by Zhang et al. (2019 https://www.sciencedirect.com/science/article/pii/S1383574218300887) showing +41% risk of NHL with glyphosate based herbicides (GBH) and Leon et al. (2019 https://academic.oup.com/ije/advance-article/doi/10.1093/ije/dyz017/5382278) who found +39% increase B-cell NHL with GBHs. See also www.atsdr.cdc.gov/toxprofiles/tp214.pdf and

https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2730779. This latter paper found less cancer on organic food diets, as may be expected from basic common sense.

It is really difficult not to be cynical when Bayer markets B-cell NHL drugs too - https://www.prnewswire.com/news-releases/bayer-receives-fda-approval-for-aliqopa-copanlisib-60-mg-vial-for-injection-in-adults-with-relapsed-follicular-lymphoma-after-two-prior-systemic-therapies-300520109.html. The cost for Aliqopa powder for injection is around $4,784 (but about twice as much in Europe at €7,915.32 = $9,000) for a supply of one dose of 60 mg.

Monsanto/Bayer's glyphosate is also associated with onset and premature mortality from Parkinson's Disease by +33% (https://www.mdpi.com/1660-4601/15/12/2885/htm; https://www.scientificamerican.com/article/parkinsons-disease-and-pesticides-whats-the-connection/). This is especially prevalent in chemical farming communities thus it perhaps comes as little surprise but much contempt that Bayer is also heavily invested ($225 million) in a cure for this other disease its products cause (https://media.bayer.com/baynews/baynews.nsf/id/Bayer-Versant-Ventures-Join-Forces-Launch-Stem-Cell-Therapy-Company-BlueRock-Therapeutics-USD).

This is exactly where they started with their patented Heroin and with poison gasses in WW1. They also produced the gas-masks! So then as now, it is a win-win for Bayer's sick/sociopathic business model.

New study also finds causal association link of autism with glyphosate alone in rural communities by up to extra +33% with a range of +27% to +60% overall and for five pesticides, especially glyposate (Roundup) (https://www.bmj.com/content/364/bmj.l962 or https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6425996/ or https://www.bmj.com/content/bmj/364/bmj.l1149.full.pdf). This condition is debilitating to the individual and to the whole family for the remainder of their lives. A simple search soon finds a link to Bayer with drug "Suramin", "Germanin" or "Bayer 205" developed in 1916 (https://www.livescience.com/59314-suramin-drug-may-treat-autism-symptoms.html). At this time during the height of WW1 Bayer's main activity was producing poison gasses so it is impossible to reconcile this with any hint of philanthropy... Significantly, Bayer bought out Merk's allergy branch and also manufactures vaccines including infant Heptatitis-B that has been implicated in several adverse reactions in babies and is untested... How evil are they?

One of my papers - https://www.mdpi.com/2571-8789/2/2/33 partly concerning Rothamsted earthworms - was recently criticized (and subsequently ignored!) by a corporate Rothamsted researcher as being unreliable because it was "independent" science (https://www.nature.com/articles/d41586-018-07059-9). What it the opposite? Possibly venal science of a bought or biased scientist. The new term for people like that is a "biostitute". Certainly I would not sign the "standard" Rothamsted research data access agreement that would have required me to submit any future paper I wrote to their offices for approval. Yet we have all seen scientific papers published with statement such as "***The author declares no conflict of interest***" and then we find that they are patent holders or have been employed by and received funding from the chemical industry in the past and expect to in the future.

The solution is surprisingly simple: all that has to be stated is that "***The author has and will received no funding from the chemical industry***". If they cannot honestly say that then they cannot be honest. What can the chemical industry, by definition, tell us about healthy ecology or natural agriculture? For agriculture the chemical industry includes the big five of Monsanto/Bayer, Syngenta, DuPont-Dow and some others. Rothamsted's earthworm "ecologist" is mainly just another (GMO/glyphosate loving) chemist:- "*Jackie is an agricultural soil scientist with key research interests in the* ***soil chemistry*** *(micronutrients, pesticides and pollutants)*..." Supporting Syngenta, backing Bayer & promoting earthworm-toxic glyphosate/Roundup. Why? What for? Surely it does not help the soil or earthworms (nor us!).

NFU's "glyphosateisvital" leaflet www.nfuonline.com/glyphosate-leaflet-feb-2017-final/ says "*Glyphosate is one of the safest plant protection products in the world and poses no risk to people when used correctly*." [Fingers-crossed, Pinocchio noses growing]; "*Glyphosate is one the most effective plant protection products in the world*." [True - it kills life including plants].

They use innocent earthworms and fake science to promote their toxic product. It's disturbingly similar to the notorious "Red Flag" campaigns in EU surreptitiously funded by

Monsanto and Bayer to promote toxic products, duping farmers to sign petitions (https://unearthed.greenpeace.org/2018/10/17/monsanto-red-flag-glyphosate-roundup-eu/ ; www.bc-legal.co.uk/bcdn/854-270-british-local-authorities-re-evaluate-glyphosate-herbicide-use-amid-french-farmer-ruling). Safe alternatives are organic IPM/IWM...

Glyphosate is "*moderately toxic to birds, most aquatic organisms, **earthworms** and honeybees*" - https://sitem.herts.ac.uk/aeru/iupac/Reports/373.htm. Many independent studies show its severe toxicity to earthworms (some null findings probably industry sponsored!?), and there are known and increasingly discovered negative human consequences of this poison (as noted above). Just one example is from 2015 - https://www.nature.com/articles/srep12886.

Glyphosate disrupts gut flora of honeybees - www.pnas.org/content/115/41/10305.short.

In test rat studies glyphosate causes oxidative damage, glutamate neurotoxicity, depression-like symptoms and memory problems in adult rats exposed in their mothers prenatally and also postnatally at low dose rates (Cattani et al. 2014, 2017; Gallegos et al. 2018).

Amino acid glutamate, a key building block of proteins that may be substituted by glyphosate.

Farmers/soil workers and their families (and pets!) are especially hard hit by toxic chemicals due to increased and constant exposure of both concentrates and dilutions. Cancer, Parkinson's and other allergic diseases are raised and their depression and suicide rates higher (www.farmbusiness.co.uk/news/more-then-one-farmer-a-week-in-the-uk-dies-by-suicide-2.html ; www.researchgate.net/publication/7370793_Farming_and_Mental_Health_Problems_and_Mental_Illness). The organophosphate Glyphosate is shown in studies reported here to affect all these outcomes, including neurological/mental problems. If it is a pathway to celiac disease and gluten intolerance it may cause depression (www.ncbi.nlm.nih.gov/pubmed/24678255 cf. www.frontiersin.org/articles/10.3389/fpubh.2017.00316/full); whereas autism rates are higher in families that live near pesticide treated fields (www.scientificamerican.com/article/autism-risk-higher-near-pesticide-treated-fields/). This alone should cause enough concern for farmers and mothers to consider going organic...

Need to get research dissenter/shills to make a simple declaration of agreement/disagreement of the position that synthetic agrichemicals are damaging to the health of soil, animals (including people and earthworms) and to the environment... and don't say "yes our old chemicals ***were*** poisonous, but our **new** products are much safer". That is same old BS so often repeated to repeat the cycle of decline.

Ghostwriting and lies for cash - www.cbc.ca/news/health/glyphosate-monsanto-intertek-studies-1.4902229 ; usrtk.org/wp-content/uploads/bsk-pdf-manager/2019/04/Ghostwriting-Monsanto-Email-Congratulating-scientists-for-their-work-on-independent-Williams-Kroes-Munro-article.pdf ; publicintegrity.org/environment/meet-the-rented-white-coats-who-defend-toxic-chemicals/ ; www.nytimes.com/2015/09/06/us/food-industry-enlisted-academics-in-gmo-lobbying-war-emails-show.html ; https://pbs.twimg.com/media/D5bsGD0WkAAi45y.jpg.

Monsanto papers update by Robert F. Kennedy Jr and legal associates - https://www.baumhedlundlaw.com/4-19-new-monsanto-papers-docs/.

US Right to Know also summarize the many independent studies showing serious problems and the official attempts to block these and the faked reports that there are no problems - https://usrtk.org/pesticides/glyphosate-health-concerns/. Also includes endocrine damage.

Perhaps the most egregious blacklisting ... http://www.seralini.fr/wp-content/uploads/2018/06/Novotny-JBPC-2018-On-Seralini-FCT-retraction.pdf ; www.gmoseralini.org/journal-retraction-of-seralini-study-is-illicit-unscientific-and-unethical/ .

Damning indictment of bought and/or selective science. A plea of ignorance or objectivity is negated when there is simple $$ gain, however small and paltry; this will to win trinkets at any cost overwhelms - https://enveurope.springeropen.com/articles/10.1186/s12302-018-0184-7 ; see also https://www.sciencedirect.com/science/article/pii/S027869151530034X?via%3Dihub.

It is worth noting that these studies reports sex hormone disruption and oxidative stress effects of glyphosate/roundup, i.e., endocrine disruption and carcinogenic potential! Q.E.D.

The Gates Foundation is funding a campaign to "end world hunger" by promoting GMO technology. The organization has hired 400 "science ambassadors" to influence agricultural policy in 35 countries.
In the last four years, the Bill and Melinda Gates Foundation has donated a total of $15 million to two global campaigns aimed at "ending world hunger" by expanding the use of GMO technology.

The first, called the "Alliance for Science," was created in 2014 with the intention of "depolarizing" the GMO debate.
The second, called "Ceres2030," was created in 2018 to help the United Nations achieve its goal of "zero hunger by 2030."
Both campaigns are headquartered at Cornell University.

The Alliance for Science has received $12 million from the Gates Foundation so far, while Ceres2030 was founded with a $3 million grant last October.

The funds for the Alliance for Science will be used "to ensure broad access to agricultural innovation, especially among small farmers in developing nations," says a Cornell University press release.

Soilhealthinstitute in USA is sponsored by an evil empire - https://soilhealthinstitute.org/wp-content/uploads/2019/03/SH-HH-post-conference-report-Final-030519.pdf but Rodale's Dr Andrew Smith attended.

"Monsanto, now a unit of Bayer AG, has marketed glyphosate for use on oats as a desiccant for years, and the company also has successfully convinced the EPA to raise the MRL for glyphosate residues allowed in oat products. In 1993, for example, the EPA had a tolerance for glyphosate in oats at 0.1 parts per million (ppm) but in 1996 Monsanto asked EPA to raise the tolerance to 20 ppm and the EPA did as asked. In 2008, at Monsanto's suggestion, the EPA again looked to raise the tolerance for glyphosate in oats, this time to 30 ppm."

I do not think the regulatory bodies have been "responsible" as the request for raising residue levels in grains from 0.1 ppm to 20 ppm and then 30 ppm for oats was from Monsanto the company that manufactured & promoted use of glyphosate as a pre-harvest desiccant. It took me a while, but I found the original EPA 1997 document here with instructions from Monsanto suggesting it is not an

independently determined safety level but rather a company cop out. Please see - https://www3.epa.gov/pesticides/chem_search/reg_actions/reregistration/tred_PC-417300_11-Apr-97.pdf . EWG found the highest levels, up to 1.3 ppm, in Quaker Old Fashioned Oats (www.ewg.org/childrenshealth/glyphosateincereal/). In court in SF, Monsanto (Bayer) was again found responsible for causing NHL in an adult. Specifically, the jury unanimously found glyphosate (Roundup) a causal factor in non-Hodgkins lymphoma (NHL) cancer (https://usrtk.org/monsanto-roundup-trial-tracker/in-blow-to-bayer-jury-finds-roundup-caused-plaintiffs-cancer/); this was supported in concurrent papers by Zhang et al. (2019 https://www.sciencedirect.com/science/article/pii/S1383574218300887) showing +41% risk of NHL with glyphosate based herbicides (GBH) and Leon et al. (2019 https://academic.oup.com/ije/advance-article/doi/10.1093/ije/dyz017/5382278) who found +39% increase B-cell NHL with GBHs. Endocrine disruption of glyphosate stated here too – Ref., Ref.

EU Glyphosate safety report is just copied from Monsanto echoing the industry applicants' assessment with up to 81.4% directly copied without acknowledging this inconvenient fact - https://www.greens-efa.eu/files/doc/docs/298ff6ed5d6a686ec799e641082cdb63.pdf ; whereas in USA the safety and risks of Glyphosate/roundup are beginning to unravel (Myers et al. 2016 - https://ehjournal.biomedcentral.com/articles/10.1186/s12940-016-0117-0).

Meanwhile...

World's crises are mounting, especially due to poisoning the soil: www.bbc.com/news/science-environment-47203344. Biodiversity, crucial for food & agriculture, is disappearing by the day mainly due to these toxic chemicals: www.fao.org/news/story/en/item/1180463/icode/.

Biodiversity: https://web.archive.org/web/20190407063512/http://www.fao.org/cgrfa/en/ http://www.fao.org/cgrfa/resources/meetings/detail-events/en/c/1180747/.

Can UN really help when they too are overwhelmed by propaganda; for example SDGs:

https://www.unenvironment.org/explore-topics/sustainable-development-goals/why-do-sustainable-development-goals-matter/goal-15 search "forest" - 11 hits; "water" – 6 hits; "soil" - 2 hits; "worm" – zero.

Agchem industry is evil and most destructive. Pharmaceutical industry has a silent "P"? Often they are the same companies, or close cousins, with little care for Nature nor Ecology.

But there is some hope for positive change on the way... one down, many yet to follow - https://www.nytimes.com/2019/05/02/health/insys-trial-verdict-kapoor.html...

Another boost is the May, 2019 finding that Monsanto/Bayer's glyphosate causes cancer with a $2 billion fine - https://glyphosategirl.com/?p=1550. Maybe their directors should be jailed?

What is the link between climate, extinction and health? – Bad ag!

What is the link between increasing autism rates, vaccines and bad Ag? – Bad reps! Dr. Peter Rost, a former vice president of Pfizer and author of *"The Whistleblower, Confessions of a Healthcare Hitman,"* - https://youtu.be/TrCizlAOBAo

Sadly, farmers are too busy battling the elements and working on ridiculously low margins, even working at a loss (with their and the families health problems), while young medics are overworked and spend all their time with worry of paying student loans. As neither group have the time to read science reports or to study themselves, both get their advice and news from chemical reps selling junk science with polished arguments. [So it seems you can polish a turd].

Another link of Ag and autism is the battles of heroic Robert F. Kennedy Jr - twitter.com/RobertKennedyJr ; https://childrenshealthdefense.org/too-many-sick-children/autism/ ; web.archive.org/web/20160328154622/http://www.robertfkennedyjr.com/articles/2005_june_16.html. [A further link is the psychopathy of the business interests in both these two fields].

Some summaries from 2009 are here - "State of chilren in the United States; 1 child in 6 with specific learning disabilities 1 child in 87 with autism 1 child in 9 with asthma 1 child in 450 with insulin dependent diabetes 15-20% of children with attention deficit disorders 1-2% children with sudden infant death". The short bus may soon be much longer... Dr Stephanie Seneff (https://en.wikipedia.org/wiki/Stephanie_Seneff) and colleagues have pioneering research on autism, Al and glyphosate, e.g. www.youtube.com/watch?v=OL9mr599hb0 and this is being supported by other studies. Seneff et al. (2012) show empirical link of Al and autism exacerbated by use of Acetaminophen (paracetamol also marketed as Tylenol) that they show also has links associated with both autism and asthma/eczema. Seneff et al. (2015) make the link with glyphosate contaminations and Al toxicity to neurological diseases, including autism, depression, dementia, anxiety disorder and Parkinson's disease.

Glyphosate linked to autism in Swanson et al. (2014: fig. 23) and in Shofield (2016: fig. 6). The study by Cynthia Nevison (2014: fig. 5) clearly shows a link between increasing autism rate and of Aluminium (Al) adjuncts in vaccines given to toddlers:

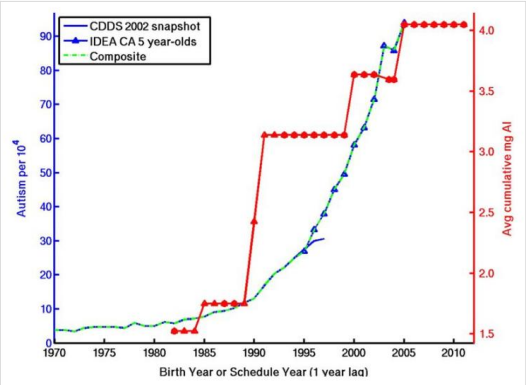


Figure 5
Temporal trend in autism compared to temporal trend in cumulative amount of postnatal aluminum adjuvant

She also (fig. 6) shows clear correlation (with initial lag?) with GMO/glyphostate that is known to cause health problems in human, animals and in cell lines so may be causal relationship:

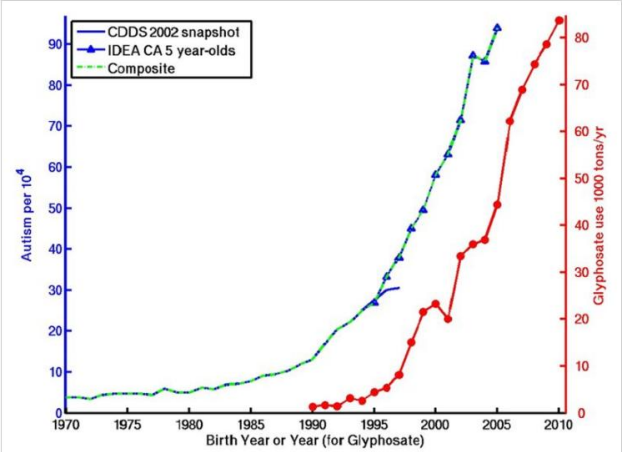
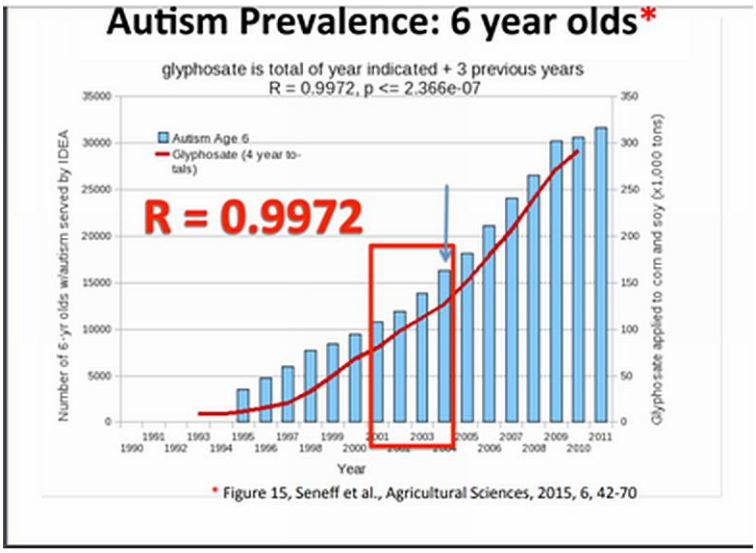


Figure 6
Temporal trend in autism compared to temporal trend in U.S. application of glyphosate to genetically-modified corn and soy

These are just two of her "top ten compounds" comprising only a small subset of the > 80,000 synthetic chemicals widely dispersed over the past 50 years, many of which have never been assessed for potential toxicity, and rarely or never in combination nor over multi-generations...

Shaw (2017) links autism to glyphosate/roundup in diet of triplets that was ameliorated somewhat by a change to organic food. He also notes the prevalence of chronic kidney disease of unknown etiology (CKDu) causing kidney failure in farmers in Sri Lanka and Central America associated with roundup too affecting over 400,000 with 20,000 deaths!

Dr. Chris Exley's study, Mold et al. (2018), show Al concentrated in autistics' brain tissue linked to vaccines, as was already determined in mice autism test studies by Shaw et al. (2013).


Autism Prevalence: 6 year olds*
glyphosate is total of year indicated + 3 previous years
R = 0.9972, p <= 2.366e-07
Autism Age 6
Glyphosate (4 year totals)
R = 0.9972
Number of 6-yr olds w/autism served by IDEA
Glyphosate applied to corn and soy (x1,000 tons)
Year
* Figure 15, Seneff et al., Agricultural Sciences, 2015, 6, 42-70

From Seneff (2018 - https://people.csail.mit.edu/seneff/2018/Seneff_Stephanie_052618.pdf) "Glyphosate + Aluminum + Mercury + Glutamate = Autism".

Contrary to the official line that many of these diseases are random or hereditary (i.e., it is your own fault or just bad luck!), because of increased rates and geographic differences they must actually be environmental. If even some of these studies are proven even partially correct, then it is already catastrophic because these child victims are the carers and leaders of the next generation, never mind the anguish pain and suffering of all involved. As Nevison (2014) asks and clearly shows: If autism was truly genetic, then how can the rates possibly be increasing so rapidly in certain countries? What, is there more genetics suddenly!? Thus autism may be induced in susceptible individuals (especially males showing a genetic aspect), extenuated perhaps by pesticide exposure. Anyway the chemical companies never fix their problems (e.g. Mobay with Agent Orange, Union-Carbide/Dow at Bhopal; and whoever killed the Pilliod's dog? https://glyphosategirl.com/?p=1397). In fact, when there is such rabid "official" opposition (as with Seralini who has now been shown both to be correct and to have been targeted and disparaged specifically by Monsanto and their paid shills including those from Rothamsted! Ref., Ref., Ref.), then it is more of an indication that there is a cover-up of deeply vested interest (i.e., not disinterested as good Science should be) just for $$. The propaganda of being "anti-science" (whereas it is truly these shills who are against true Science) if you reject GMOs for well-founded reasons, or if mothers call for separate and essential vaccines spread out for better safety of their children (and perhaps not to anyone with susceptibility, as per normal distribution bell-curve...) or if we demand wholesome food from healthy soil. Someone should call them out for lack of respect for Nature upon which they and their kids (and pets) depend.

From www.periscopegroup.com/roundup/roundup-and-parkinsons-disease (Can Roundup Cause Parkinson's Disease? By Christina Morales | Mar 29, 2019): "*Roundup has been scientifically linked to cancer (brain, breast and non Hodgkin lymphoma), autism, infertility, birth defects, kidney disease, celiac disease and gluten intolerance, respiratory problems, and many more chronic conditions. Even with piles of studies showing the dangers of glyphosate and Roundup, Bayer refuses to admit that their herbicide is hazardous and refuses to even put a warning on the label. You could continue to use Roundup, but do you really think it's worth the risk? "#Sources*

"WSU research suggests glyphosate-Parkinson's link". iFIBERone News. Accessed March 14, 2019. http://www.ifiberone.com/wenatchee/wsu-research-suggests-glyphosate-parkinson-s-link/article_ebdebc94-45c7-11e9-8744-cb36ea6578e1.html

"Monsanto's Roundup, Glyphosate Linked to Parkinson's and Similar Diseases". Natural Society. Accessed March 14, 2019. http://naturalsociety.com/monsantos-roundup-glyphosate-parkinsons-neurodegenerative/

"Parkinson's Disease and Pesticides: What's the Connection?" Scientific American. Accessed March 14, 2019. https://www.scientificamerican.com/article/parkinsons-disease-and-pesticides-whats-the-connection/

"UW study: Exposure to chemical in Roundup increases risk for cancer". University of Washington. Accessed March 14, 2019. https://www.washington.edu/news/2019/02/13/uw-study-exposure-to-chemical-in-roundup-increases-risk-for-cancer/

"Mechanisms underlying the neurotoxicity induced by glyphosate-based herbicide in immature rat hippocampus: Involvement of glutamate excitotoxicity". Science Direct. Accessed March 21, 2019. https://www.sciencedirect.com/science/article/pii/S0300483X14000493?via%3Dihub

"Glyphosate induced cell death through apoptotic and autophagic mechanisms." NCBI. Accessed March 21, 2019. https://www.ncbi.nlm.nih.gov/pubmed/22504123

"Parkinson's Disease: Caused by Glyphosate (Monsanto) and/or Trichloroethylene?". Oradix. Accessed March 21, 2019. https://oradix.com/parkinson-s-disease-caused-by-glyphosate-monsanto-and-or-trichloroethylene/"

It gets worse! – Seralini team's study (Mesnage et al. 2015) showed that commercial supplies of rat chow are often contaminated with several toxins and heavy metals, including ubiquitous glyphosate. So, unless the test rats' diet is organic (and even then it may be contaminated!!), then the control animals in the supposedly untreated diets may have exposure to pervasive residues. Thus the true outcomes may be relatively much more severe than detected and, conversely, supposedly safe studies suspect!! See - www.gmoseralini.org/contaminated-lab-feed-invalidates-commercialization-of-chemicals-and-gmos-new-study/.

It gets even worse!! – A study published in April 2019 by Kubsad et al. (2019) confirms multi-generational effects of glyphosate on rat test subjects (these Sprague-Dawley rats were used by Seralini). The effects on the rats were especially in testis and ovaries (i.e. part of endocrine systems that are thus disrupted) and also resulted in "seizures" indicating brain damage too. Skinner's team call this "**generational toxicology**" and it is recorded for fungicides, pesticides, jet fuel, the plastics compound bisphenol A, the insect repellant DEET, the herbicide atrazine, and now glyphosate is confirmed. Epigenetic changes turn genes on and off due to environmental influences implying genetic susceptibility to exposure and inheritance.

Then some!! – Glyphosate is everywhere - www.globalresearch.ca/glyphosate-worse/5674472.

This multi-generational effect is well known with MOBAY's Agent Orange in Vietnam. Even as the damage continues, on top of yearly salary, CEOs took multi-million $$ bonuses for last year of both Monsanto (Mr Hugh Grant $32–123 million www.stltoday.com/business/columns/david-nicklaus/bonus-and-stock-lift-monsanto-ceo-s-pay-to-million/article_fc7f785f-d967-5e10-abb0-ff67ffc86da4.html ; https://www.reuters.com/article/us-monsanto-m-a-bayer-payout-idUSKCN0YI1W9; https://monsanto.com/investors/historical-lookup/) and Bayer (Mr Werner Baumann $7 m - www.healthcareglobal.com/top10/top-10-highest-paid-pharma-ceos), dis-respectively. This greedy shamelessness is beyond evil☹):-

{Philip Jones Griffiths photo of an innocent, inherited Agent Orange sufferer in Vietnam}. This photo is more demonstrative of effects than all the abstract red figures on a graph, it succinctly shows consequences of heartless chemists being oblivious to the inherent beauty of biology and pain of sadness. Update for her is still no compensation comfort nor clean up from MOBAY/Dow – see https://e.vnexpress.net/news/news/vietnam-cries-foul-as-monsanto-victims-get-huge-compensation-in-us-3911419.html. MOBAY was a previous manifestation of Monsanto-Bayer merger https://regenerationvermont.org/monsanto-and-bayers-chemical-romance-heroin-nerve-gas-and-agent-orange/ - "It's a sordid past made possible largely by the result of mergers and acquisitions, where corporate power became so great that it overwhelmed laws and simple human decency."

DARKNESS (as in Dark Ages of Ignorance)

"**Science has taken a turn towards Darkness**" (Horton 2015 www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736%2815%2960696-1.pdf). His full quote: "***The case against science is straightforward: much of the scientific literature, perhaps half, may simply be untrue. Afflicted by studies with small sample sizes, tiny effects, invalid exploratory analyses, and flagrant conflicts of interest*** [i.e., venal or vested science from compromised scientists, or biostitutes]***, together with an obsession for pursuing fashionable trends of dubious importance, science has taken a turn towards darkness***."

The major problem is that normal people do not have the capacity to realize or believe that some individuals who work for company bonus cash can be so ruthless, dishonest and evil (or maybe, to give them some benefit of doubt, just so incredibly stupid). Sometimes even Harvard graduates lie and cheat - https://publicintegrity.org/environment/meet-the-rented-white-coats-who-defend-toxic-chemicals/ . And I personally know of Oxford graduates who lie too... Yet the public still has confidence - www.nature.com/news/misplaced-faith-1.17684.

Most worrying is that companies, often chemical companies, sponsor studies but do not list themselves as such. Universities are also secretly or overtly funded, with chemical reps on their research boards "helping" to direct research towards their desired goal (just $ profit).

Shame is that the populace believe they should trust science more than scientists do! In 2015 *Nature* (https://www.nature.com/news/misplaced-faith-1.17684) asked "**Nine in ten people trust scientists to follow the rules. How many scientists would say the same?**" See also this USA poll review: https://www.pewresearch.org/science/2015/01/29/public-and-scientists-views-on-science-and-society/.

Scientists speak:

"More than two-thirds of researchers [72%] said they knew of colleagues who had committed "questionable" practices and one in seven said that included inventing findings. But when scientists were asked about their own behaviour only two per cent [1.97%] admitted to having faked results." - https://www.telegraph.co.uk/news/science/science-news/5438844/Scientists-faking-results-and-omitting-unwanted-findings-in-research.html this from study by Fanelli (2009) - https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0005738&type=printable – "*... misconduct was reported more frequently by medical/ pharmacological researchers than others. Considering that these surveys ask sensitive questions and have other limitations,* ***it appears likely that this is a conservative estimate of the true prevalence of scientific misconduct***." Perhaps you can realize the dire implication of health researchers lying for $$...

The obligatory (optionally but often anonymous) peer-review is also widely questioned by many (as summarized by www.scientific-alliance.org/newsletter/perils-peer-review) but

without providing any better options. Horton (2000) commented: "*Editors and scientists alike insist on the pivotal importance of peer review. We portray peer review to the public as a quasi-sacred process that helps to make science our most objective truth teller.* ***But we know that the system of peer review is biased, unjust, unaccountable, incomplete, easily fixed, often insulting, usually ignorant, occasionally foolish, and frequently wrong****."* Reviewers also get $$ from their institutes as part of "job description" to review and to publish: Pressure to peer?

Having grant application ideas, scientific reports or even whole papers and figures kidnapped, and data usurped is experienced by most researchers; often by arrogant, egoistical professors. My own work appears uncited under other people's names. A referee's deliberate delay is in order to publish their own paper for them to get priority. And there is also pedantic pettiness: one paper was rejected because I had two spaces rather than one after the full-stop; another because I refused to calculate mass and time as SI grammes & seconds (I had tonnes & years!); another saying (wrongly!) that it should be "agrochemical" not "agrichemical"; etc... Then there are shady characters. Last year my papers on earthworm ecology were anonymously reviewed and the journal published reviewers' names thanking them at the end of the year. Two names I recognized were one guy who was sacked from CSIRO but had visited me when I was studying; we talked and I told him about my choice-trial experiments. The following year he published the same study without citing my earlier work nor acknowledging my ideas. The other French guy ordered a copy of my published book on CD, but he promptly sent it back without paying (obviously he had just copied it for free). Having such low calibre types volunteering to referee papers is creepy. Maybe they can steal more of other peoples' work...

Another shameful CSIRO referee blocked my organic earthworm study draft because he thought organic was the same as min-till and said such studies were already reported. What an idiot! It actually took me 20 years to finally publish that study from 1980 (Blakemore 2000)...

The current manuscript received these anonymous (agrichemical workers I think) referees' reports (and, once again, the saying "*pearls before swine*" comes to mind...):

Climate-496756: Humic Carbon to Fix Food, Climate and Health Submission Date 16 April 2019

Comments and Suggestions for Authors: my responses in red...
REFEREE 1

This manuscript essentially tries to make the case that earthworm based organic husbandry will solve many of the worlds [sic] major problems from climate change, human health issues and food security. Whilst it would be wonderful if it could, I am unconvinced by the arguments put forward and which vastly oversimplify the situation and causes of these problems. I have to disagree as I think some studies make simple solutions more complex. Simple is always better!

I have a number of very significant issues with this manuscript. Firstly, I am not sure where the new science is as it reads like a theory supported by selected references. The methodological description is extremely vague and the chatter in the results section does not tie up to the limited information provided regarding the methodology. Perhaps the referee is too uneducated or simple minded to understand. As stated I am revising (not "reviewing") all NASA and IPCC data with new calculations for SOC and NPP and biomass on land. This is what I did. This appears to be a review of sorts but there is no information on what type of review or how it was conducted in terms of databases, journals, timeframes, numbers of articles reviewed etc. Importantly, it is not clear what the review question was. [It is not a review, maybe that is why...]. The methodological description does not explain how the data retrieved was critiqued and organised [It is not a frigging review!!!]. Hence it is simply not possible to see how the conclusions have been reached. Therefore I would suggest that the methodology section is completely re-written such that the reader can see exactly how the review [It is not... aww, what's the point in reexplaining?] was conducted. All based on IPCC data as summarized in their figure 6.1. http://www.climatechange2013.org/images/figures/WGI_AR5_Fig6-1_errata.jpg !!!!!!

The manuscript is also extremely hard to follow as it tends to ramble and lacks focus and structure. [Maybe you are drunk?]. There is a lack of readability with the text lacking a 'story line' which fails to develop into a rationale for the work. It reads in many places like a collection of vaguely connected facts. Referencing also needs to be improved as many major and important articles have been omitted. For example, line 52 refers to 'toxic agrichemicals' (should read agrochemicals No, sorry, this is an option – I studied agr**I**chemicals in 1970s and in my PhD in agr**O**ecology!) but then just references Carson, 1963. Whilst Rachael Carson's book was an important milestone in pesticide regulation it is far from being an appropriate reference in this instance. The text does continue with a specific example of glyphosate but the references cited have been very selectively chosen to make a point. It is a good point as there have been two trials in USA determining what is true and untrue and also there is a third trial in progress this week [now also found guilty of corrupting science and "scientists" lying just for profit]. As it is found again to be a carcinogen based upon the evidence and science then that chemical will likely be withdrawn. But the need for it is questionable as there have always been organic solutions and the yields and performances are often above those of the agrichemical industry sponsored studies – I presented a review last year - https://www.mdpi.com/2571-8789/2/2/33. Indeed, there are several instances in this manuscript which could easily be challenged as selective referencing to support a theory. Do you have any better suggestions to solve the imminent crisis? My paper should be presented to allow open discussion by all parties and I have supported all the facts and data presented with citations, whether you like them or not. Also I cannot find independent studies that support glyphosate, all are industry-funded: i.e., bought and paid for by the producers!

Through the introduction, in particular, there is often reference to third party works and published articles which are not adequately explained - more is needed than just a reference e.g. Scripps; Mauna Loa (line 27), the Drawdown project (line 39), Callendar's effect (line 75) – there are many others. These link to the internet or allow Googling.

It may well be that there is an interesting article in there somewhere but I cannot recommend it for publication as it stands. I have entirely revised the draft submitted but I am trying to keep it under 8 pages total for ease of reading.

Other issues:
Figures are all over a poor quality. Not as far as my computer display. Perhaps you need to zoom or maybe glasses?
Abbreviations and chemical symbols must be spelt out in full the first time they are used e.g. Carbon dioxide at line 22.
Abbreviations and chemical symbols should be avoided where ever possible in abstracts. These are often read by individuals with limited knowledge of the subject. If someone does not know that CO2 is carbon dioxide or what NASA or IPCC stands for then they will probably stick with their sports and entertainment channels rather than read studies.
Referencing format is not in line with this journals format. Just a number in square brackets is needed, not author and date as well. This makes it much easier to process on first draft. Also i like to give page and figure numbers for ease.
Date of this review 25 Apr 2019 10:38:28 [A weekday in standard work-time, probably on a company computer... All I am implying is that it is not on a weekend, at an out of standard 9-5 schedule and thus probably not at all independent].

REFEREE 2

Although the title and subject of the paper is interesting but it greatly misses the structure and flow to depict the issues addressed scientifically with some very unrealistic claims of reclaiming carbon etc. These are not unrealistic as all are based upon IPCC'S own data, revised because they miss the subsequent raising land surface area and so soil carbon and net primary production - https://www.mdpi.com/2571-8789/2/4/64). The focus of the paper does not seem to be in line and deviates many times to conflicting ideas. There are section headings that explain the topic and I tried to be succinct to keep the MS under 8 pages for ease of reading. Most ancillary data is farmed off in a supplement file S1. The method is just based on the review of published reports while the findings are presented as if they come from fresh experiments. The new information https://www.mdpi.com/2571-8789/2/4/64 allows recalculation of new data and rates. Many of the figures too are just copied from reports with even figure numbers of parent document visible.Yes, i know - that is to clearly show their sources (but I have now cropped them). Also the first two figures are my own not copies. The conclusions are also confusing and hefty with poor practical implications. EU is recommending spending 4% of GDP on climate. My shutdown for a week may cost about 2% of GDP (one week) but this as savings not expense. Anyway I am not so concerned about the economics, more the ecology that is being destroyed even as we watch. The language is although good but there are off course grammatical/typo issues. The abstract is also not informative and concludes poorly. The introduction of the topic covers a lot of ideas, theories and problems which seem out of the scope of the paper. Sorry I am an ecologist so there are many connections in natural systems; the link between climate and extinction is incontrovertible; ditto food and health. That the simple expedient of organic farming may solve many problems simultaneously should not be a surprise to any thinking person. Anyway, business as usual is not possible on a finite planet and most sensible people realize that there need to be fundamental changes. Actually my proposal is the most painless and easily applied. Unless you are awaiting the wonder techo solution of artificial trees or hydroponics or moving to Mars. Really? What is a better solution?

Date of this review 07 May 2019 08:53:23

Academic Editor Notes

There are several major issues in this manuscript as suggested by the reviewers. (1) There seems to be no innovation or finding in this manuscript. (2) The methodology is vague. (3) It is confusing whether this manuscript is intended to be an academic article or review. (4) The manuscript lacks focus and structure.

My response (9th May, 2019).

Science is based upon models that are revised and refined as more information becomes available. It is not a cosy consensus club: there is always debate and improvement.

Currently global all models are wrong as, incredulously, they ignore terrain and topography! Rather they are all based upon planimetric, i.e. flat map, models of NASA/NOAA but, because the land is hilly and the soil bumpy, these land values all require recalibration.

My study published last year (https://www.mdpi.com/2571-8789/2/4/64) raised soil organic carbon (SOC) pool from IPCC's rather vague 1,500–2,400 Gt C to >8,580 Gt or a four-fold increase. The permafrost component that adds ~1,700 Gt C to IPPCs total as is discussed. My doubling of land surface area also doubles net primary productivity (NPP) on land from around 100 Gt C/yr to >218 Gt C/yr and also more than doubles the terrestrial biota from about 600 Gt C to about 2,000 Gt C. This is partly because the below-ground soil components are almost always overlooked.

My present research paper MS recalculates global carbon cycles with these revised terrestrial components and tries to estimate carbon cycle values and ***newly*** comes up with a figure of one week, i.e., 800 Gt atmospheric C process at a rate of >218 Gt C/yr = about one week needed to offset atmospheric carbon excess (4 Gt C) via natural photosynthesis.

Actually IPCC has the same conclusion but coming from some different empirical data since IPCC AR4-WG1 (2007: 948 https://www.ipcc.ch/site/assets/uploads/2018/05/ar4_wg1_full_report-1.pdf) says: "***Carbon dioxide (CO_2) is an extreme example. Its turnover time is only about four years because of the rapid exchange between the atmosphere and the ocean and terrestrial biota. However, a large part of that CO_2 is returned to the atmosphere within a few years.***" Thus they give CO_2 turnover time (= residence time) of about 4 yrs. Thus total atmospheric C of 800 Gt if recycled in 4 years, or 208 weeks, takes just one week to processs 4 Gt C. Q.E.D.

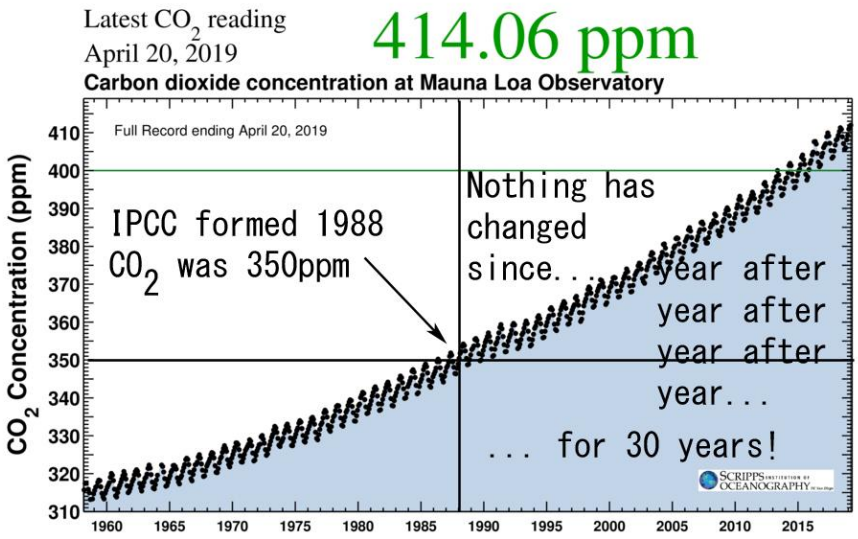
I ignore the oceanic component as this is passive gas exchange (total +2 Gt C per year) that depends upon the atmospheric concentration and on the temperature of the ocean water. If included then it will actually improve the processing time of atmospheric carbon.

Levelling excess atmospheric CO_2 is not sufficient however, as there needs to be drawdown and the only way to do this is with increased photosynthesis with storage in soil. Actually this is the international 4p1000.org proposal for 0.4% extra SOC. However, my studies that quadruple soil carbon mean that only 0.1% extra carbon storage is required!

I am sorry if the referees found the article difficult to follow but my aim was to keep it under five pages by farming off the complex calculations and source data in a supplementary file (S1 that is now over 65 pages!!). The MS is a compromise of 8 pages of compact information. Their other objections are answered in the point form below.

Overridingly, there is a great importance to this study that must be emphasized: IPCC (2018 https://www.ipcc.ch/sr15/) gives us just 12 years – to 2030 – in order to fix global warming. There are no feasible methods except, perhaps, mine... This week Scripps Mauna Loa's CO2 totals exceeded 415 ppm for the first time - https://scripps.ucsd.edu/programs/keelingcurve/wp-content/plugins/sio-bluemoon/graphs/mlo_one_week.png. Regarding species extinctions. I know agriculture is political rather than science based but this must change. This year I reported loss of two earthworm species, one from NZ and one from Japan due to agriculture and industrial expansion (http://nh.kanagawa-museum.jp/files/data/pdf/bulletin/48/bull48_55_60_blakemore.pdf ; http://nh.kanagawa-museum.jp/files/data/pdf/bulletin/48/bull48_61_68_blakemore.pdf). This spring the swallows did not return to my town as usual and there really are so few flying insects. If these are like the proverbial canaries in a mine, it is inevitable that we must re-adopt organic farming or perish in a short time.

Next week I will attend the IPCC-49 meeting in Kyoto. IPCC has been meeting for 30 years. Just like Rachel Carson's work that made no difference to agrichemical pollution, they have made no difference to the accumulation of CO2 in the atmosphere!



Perhaps my study, if published by *MDPI Climate*, would stimulate some debate for a rapid effort to solve the problem. If the MS remains unpublished the there will presumably be no reasonable suggestion, just more of the same prevarication and waste of resources until humanity's certain decline to irretrievable collapse taking many other species with us.

For the academic editor's points:
"(1) There seems to be no innovation or finding in this manuscript. (2) The methodology is vague. (3) It is confusing whether this manuscript is intended to be an academic article or review. (4) The manuscript lacks focus and structure"

(1) The remarkable innovation is revision of all prior IPCC calculations for carbon cycle. **Do you know of any other prior suggestion to simply shutdown for a week to solve excess C!?** (2) Methodology is clearly stated and applied in the MS. (3) It is an academic article as it is pointless to review all the dissenting studies, only the end-points are relevant and no prior work has included my new soil carbon totals (some have come to similar conclusions but from different viewpoints). All my starting data values are based upon IPCC's review figures. (4) It is focused in order to keep it short (8 pages) but because of this the structure is succinct and direct with references that are key rather than exhaustive. However, the attached S1 file does have much background supporting information and explanation of the summaries presented.

If the paper gets published then I am most willing to collaborate with others on refining the data and options. Currently however there is almost no funding for soil ecology and there is not a single SOIL ECOLOGY INSTITUTE to study and promote below ground life. Almost all agricultural research station only promote chemical or at best microbial research and are failing as the soil is being poisoned and eroded daily (2,000 tonnes per second lost!). There are few earthworm researchers remaining anywhere, yet these humble organisms may provide the best solution in two ways: from vermicomposting organic wastes and by rebuilding topsoils.

Respectfully [in retrospect after 30th May rejection this should've been "With all due respect"], RB, Zama, Japan 10th May, 2019.

Other fakes and charlatans are exposed here - https://usrtk.org/pesticides/glyphosate-spin-check-tracking-claims-about-the-most-widely-used-herbicide/ and here https://usrtk.org/gmo/tracking-the-agrichemical-industry-propaganda-network/ in May 2019, including Cornell Uni. And I am bravely willing to take their challenge that if glyphosate is as safe as coffee or table salt: I will risk drinking a cup of coffee, or even seawater, if those proponents drink a cup of Roundup. Well I guess that's pretty much nailed that argument...

Science needs to be fact or truth-based, but also compassionate, responsible, respectful and meaningful... and most of all honest! Despite its fakery, flaws and obvious broad corruption, Scientific ideals yet offer our best hope for humanity and for Nature. There are I hope just enough selfless heroes to carry us over all the obstacles.

Regarding the anthropogenic global warming (AGW) and climate change debate.... my initial draft stated:

"*On another topic: Harde (2017) summarized: "The anthropogenic contribution to the actual CO2 concentration is found to be 4.3%, its fraction to the CO2 increase over the Industrial Era is 15% and the* ***average residence time 4 years****." A rebuttal paper by Kohler et al. (2018) rejects many of Harde's claims but accepts "reasonable approximations for the residence time". They state "Total anthropogenic CO2 from fossil fuel and cement production emitted between 1750 and 2010 has accumulated to 365 PgC (Le Qu´er´e et al., 2016). A further 153 PgC was emitted in the same time interval from land use changes (Le Qu´er´e et al., 2016)... The missing residual of the anthropogenic emissions of 130 PgC is assigned to terrestrial carbon uptake."*

However, both papers understate, or ignore, terrestrial carbon (as in IPCC figure &.1 below) having at most just 2,400 Gt soil carbon rather than my estimated minimum of 8,500 Gt and annual global photosynthesis at just 123 Gt p.a. rather than my estimate of about 240 Gt p.a. Harde, as with IPCC, also shows an inconsequential marine biota of just 3 Gt C in total."

I did not realize it at the time but this issue has caused considerable debate and "official" scientific censorship – just as with the agrichemicals and pharmaceuticals (and as with tobacco industry)! The whole unravelling is here in various stages by two sides who both seem to have vested and/or political interests – just like Tweedle Dum and Tweedle Dumber fighting over which side to open a boiled egg: The sharp end or the blunt end? That does not matter, the issue is that the house is on fire and if you are still eating meat and driving SUV with air-con in your house then you have no moral grounds to complain either way. And if you take a dollar to make an argument either way without morals, you should be publicly exposed.

The greatest sin of charlatan scientists is selling Science out for slight personal gain.

https://notrickszone.com/2018/08/27/agw-gatekeepers-censor-the-co2-climate-debate-by-refusing-to-publish-authors-response-to-criticism/comment-page-1/

https://skepticalscience.com/Murry-Salby-CO2-rise-natural.htm

https://edberry.com/blog/climate-physics/agw-hypothesis/contradictions-to-ipccs-climate-change-theory/

https://ams.confex.com/ams/2019Annual/meetingapp.cgi/Paper/349565

https://ams.confex.com/ams/2019Annual/mediafile/Manuscript/Paper349565/Contradictions%20to%20IPCC%27s%20Climate%20Change%20Theory.pdf

I like the comment in this latter paper: "*Respectfully, the IPCC theory fails the scientific method. It makes wrong predictions. It contradicts physics. Its so-called "state of the art in peer-reviewed literature" is a repetition of inbred, invalid, pampered, and protected claims.* ***It is time for Toto to pull the curtain to reveal the wizard for the fraud that it is***."

IPCC in operation for 30 years... change in CO2 accumulation on their watch? ZERO!! Just like marine mafia, if they actually do fix the problem, then no more international conference junkets...

-oOo-

In May, 2019 I attended a side event to the IPCC's 49th meeting in Kyoto. The symposium I attended was organized by Japan's MAFF (Ministry of Agriculture, Forestry & Fisheries) called "*Agriculture is the solution! for climate change*". It is a misnomer and should be "*Chemical agriculture is the problem!*". In the next few lines I'll try to explain why this is so.

My credentials to present an opinion are that, unlike most attendees at the conference, I actually grew up in the country working on farms and with gamekeepers from about age nine. Rather than monoculture farms or stock ranches, these were the mixed dairy and arable farms of Shropshire. Incidentally, this rural county is the birthplace of the Industrial Revolution and also of both Charles Darwin (who spent most of his professional life studying earthworms) and of Sir Albert Howard (who is called the 'Father of Organics'). My BSc research was on Lady Eve Balfour's experimental organic farm at Haughley, Suffolk in 1980 and my PhD in tropical agro-ecology specialized in earthworm eco-taxonomy. So I have spent a lot of time digging the earth.

Chemical agriculture is the problem because, apart from poisoning the environment (especially farmers, children and all wildlife), it has depleted precious topsoil and killed the earthworms. What do worms and topsoil have in common? Humus or, as Darwin called it, "*vegetable mould*". This is the carbon rich and microbially active superficial layer of soil upon which we depend for 99% of food. (Please check: less than 1% of human food comes from the oceans and fisheries, despite what the marine mob says). Topsoil holds more carbon (>8,580 Giga-tonnes or Gt) than the atmosphere (800 Gt), forests (about 550 Gt but now raised to >1,000 Gt) and surface ocean (900 Gt) combined (Fig. 3). Soil is the Earth's greatest active carbon sink.

Exactly 100 years ago, after WW1, synthetic fertilisers (really nitrate products for explosives) and toxic biocides (developed to kill soldiers in trenches) were both redirected for agricultural use, becoming intensively promoted after WW2, especially in the so-called Green Revolution

(that may have been more of a Blue Revolution as irrigation expansion correlates more with crop yields than do the synthetic chemicals). What is now required, and I think there is no other choice, is a 'Brown Revolution' to rebuild our topsoils by vermi-composting.

Two memorable events happened in May, 2019: The keeling curve exceeded 415 ppm for the first time in human history and the third glyphosate trial in the USA found Monsanto/Bayer guilty of knowingly promoting cancer. They were fined $2 billion. Both events interlink.

The Kyoto meeting had many presentations overtly or covertly sponsored by Bayer/Monsanto and/or Syngenta who must now be ignored as they are violent (Bayer made the poison gases of WW1 and as MOBAY, a previous manifestation of their merger, made Agent Orange!), venal and profit-driven having little regard (outside of paid lip-service) for Nature nor humanity. Some other joker was saying sea-weed was a fix and presented fake data showing it stored more carbon that trees. Then there was a particularly misinformed NZ meat promotion. It should also be mentioned in passing that charcoal use (heavily marketed as "biochar" by "biocharlatans") offers no tangible advantage over tried and tested compost which is Nature's proven solution via organic farming that sequesters atmospheric carbon in soil humus. The only thoughtful and positive presentations were of a paddy organic restoration of their fishes and a representative from MAFF actually acknowledging that Japan needs more compost. Yeah! But they also said: "*Solutions must be science based*" and that "*Business as usual cannot continue*" while they promoted fake science with business as usual! What hypocrites...

With chemical farming it takes 10 units of fossil fuel energy to produce one unit of food energy. Thus the field trip organized by MAFF did not make much sense: We visited a canola facility which processed used oil into a biodiesel additive. It would be more efficient to just use the fossil oil!! Secondly we went to a chemical hydroponic facility that used fossil-fuel based fertilizers and pesticides (both toxic to humans). No soil there! And because of this chemical dependency and lack of recycling such operations are not certified as ORGANIC. What I also noticed were fields of solar panels, again these block the soil and photosynthesis so are actually counter-productive to carbon sequestration! Better put panels on roofs of houses that use the energy, or over useless lakes. Better yet, use geothermal energy, especially in Japan!!

To make real change all human efforts (with or without venal politicians support) should redirect all research funding and chemical subsidies, as an urgent priority, towards saving and restoring biodiversity in the fields and countryside by helping farmers transition to organic. The way for individuals to do this is to buy organic and to reject arrogant/ignorant pollies. This has been achieved successfully within a couple of years by two states in India and many other countries now also have Organic Action *Plans*. Meanwhile, the biological clock counts down for each of us, one and all...

As Bill Mollison noted: There is an ongoing War on Nature that he sincerely hoped we lose.

FINANCIAL TEMPTATIONS and FACTUAL REALISMS of a FINITE EARTH

Value of 'free' ecological services has a median value of US$135 trillion per year that is almost double the global economic GDP of around $75 trillion (https://www.mdpi.com/2571-8789/2/2/33).

IPCC's most recent special report (2018) says renewable energy needs to replace fossil fuels by 2050 with an investment worldwide of $2.4 trillion per yr for fifteen years. My shutdown for one week (2% of a year) would be about 2% of global GDP, or about $1.5 t/yr. But, because the plan is to do nothing, any loss would be neutral or low as costs are low. Anyway, economic and ecological aims must converge to be neutral rather than negative as they are now. Unlimited economic growth is impractical with a finite ecological world: Economy ***is*** Ecology's bitch!

The transition to organic would probably have zero cost too or positive gains as there would be no need for expensive and useless chemical research and government subsidies for this. The crop yields would be the same or higher and there would be massive savings in health and environmental costs. Anyway, there is no choice because if chemicals destroy the soil there is no food. Not even worth mentioning the pathetically inadequate "vertical farming" or hydroponics (but aquaponics is a definitely useful occupation and means of production).

Food is the largest single global trade at about $4.5 trillion per year in a food & beverages market of over $5.6 trillion in 2017 (source - https://www.reportlinker.com/p05312926 2019) including alcoholic ($1.16 t) and non alcoholic beverages, human food e.g. grain products, fruit and vegetables, meat, poultry and seafood, canning, pickling, and drying or frozen food and dairy; pet food and tobacco. Seemingly pets consume about one third (33%) of meat and produce about one third as much manure as humans, in the USA that is (ref - https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0181301).

Largest (mostly legal) global industries compared to Nature's value of $135,000 billion:

1. Health – $7,724 billion (https://aboutdigitalhealth.com/2019/03/15/global-health-2019/).

2. Food & Drinks – $5,650 billion (food about $4,500 and alcohol about $1,150)

3. Chemicals – $3,000 billion (https://en.wikipedia.org/wiki/Chemical_industry)

4. OPEC Revenue – $1,027 billion (OIL)

6. Telecommunications – $957 billion

7. Pharmaceutics – $950 billion (some, or all, included in Health or Chemicals above)

- cancer ($124 billion) and increasing exponentially
- vaccines ($24 billion) and increasing exponentially

8. Agrichemicals – $224 billion (included in Chemicals above but not including actually paying for damage caused... in which case they would probably owe us heaps and be deeply in red).

- Monsanto/Bayer profit 2015- $ 23.1 billion.
- SYNGENTA/ChemChina - $14.8 billion.
- Dupont/Dow -$14.6 billion.
- BASF - $5.8 billion.

Together, BAYER/MONSANTO market 25% of pesticides and about 30% seeds for genetically manipulated and conventional arable crops. They make more than 90% of all GMO seeds. While Monsanto made toxic glyphosate herbicides, Bayer makes the dangerous neonics.

Use of agrichemicals actually creates resistant weeds and favours the often exotic pest species by killing natural predators and their plant reservoirs ("weeds") thereby threatening the survival of native species diversity. They also induce chronic illness in humans requiring medicines supplied, often (always?), by the same companies. Both these industries are subsidized by taxes: e.g. in Japan agrichems by 50% and pharmaceuticals from pharmacies by 70%. This perfect business model is not good for real people. Perhaps the greatest joke on Earth is government taxes people pay are often given to companies in the guise of subsidies to allow them huge excess profits that are then used to continue to bribe politicians to gift them even greater subsidies (without ever paying environmental/health costs to nature/people).

Sad news is that the "hyperalarming" decline of invertebrates due to chemical farming has again made headlines - https://www.theguardian.com/environment/2019/feb/10/plummeting-insect-numbers-threaten-collapse-of-nature .

Ditto these guys - https://www.sciencedirect.com/science/article/pii/S0006320718313636 .

Of course they ignore my earthworm decline paper... www.mdpi.com/2571-8789/2/2/33.

The good news is review study saying need to restore topsoil as a priority - https://www.bbc.com/news/science-environment-47203344 .

Of course they ignore my topsoil paper... https://www.mdpi.com/2571-8789/2/4/64.

Agchem industry is evil and most destructive. Pharmaceutical industry has a silent "P"?

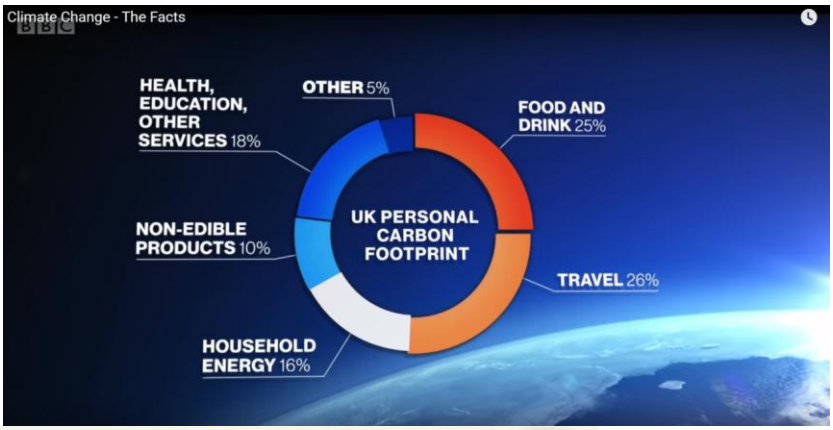
On the positive side... True Science versus advertising; the former should ultimately win.

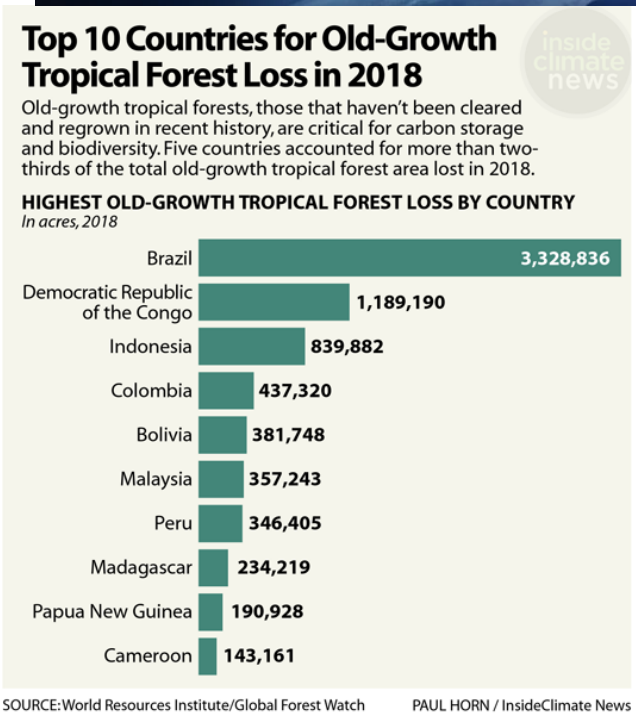
This 2019 study shows organic diet for a week rids body of tested biocide burden - www.sciencedirect.com/science/article/pii/S0013935119300246 ; 1bps6437gg8c169i0y1drtgz-wpengine.netdna-ssl.com/wp-content/uploads/2019/01/OrganicForAll_report_Final.pdf.It supports the finding of a similar study in Japan commissioned by Greenpeace in 2016 - https://www.greenpeace.org/archive-japan/Global/japan/pdf/201612_Greenpeace_Pesticide_study.pdf .

The need is to remove government subsidies e.g. (as noted above) in Japan of 50% for agrichems and 70% for pharmaceuticals when these poisons make us sick that are paid, often to the self same company) and redirect them to cover 2–3 year transition to organic that was

highlighted by the 100% conversion in several Indian states. Also all irrelevant space & ocean research should be cancelled and all chemical agricultural colleges closed, replacing them with organic schools or Permaculture colleges. Academics need to be less arrogant and/or ignorant by admitting their funding sources with true “no conflict of interest” statements/proof and paying the penalty for lying. Due to this greed, Science has lost its respect, dignity and purpose.

In UK carbon footprint summary from BBC (April, 2019), sustenance is greatest cost overall:




Top 10 Countries for Old-Growth Tropical Forest Loss in 2018
Old-growth tropical forests, those that haven't been cleared and regrown in recent history, are critical for carbon storage and biodiversity. Five countries accounted for more than two-thirds of the total old-growth tropical forest area lost in 2018.
HIGHEST OLD-GROWTH TROPICAL FOREST LOSS BY COUNTRY
In acres, 2018
Brazil 3,328,836
Democratic Republic of the Congo 1,189,190
Indonesia 839,882
Colombia 437,320
Bolivia 381,748
Malaysia 357,243
Peru 346,405
Madagascar 234,219
Papua New Guinea 190,928
Cameroon 143,161
SOURCE: World Resources Institute/Global Forest Watch
PAUL HORN / InsideClimate News

Preventing GMO soy in Brazil should be an urgent priority (most goes to western stock feeds), as it relies on Bayer’s cancer-causing herbicide glyphosate. Another link between Bayer and southern Brazil is that many Germans escaped there after WW2, including Dr Josef Mengele, the “Angel of Death” who performed grotesque experiments for Bayer at Auschwitz (www.theguardian.com/world/1999/feb/19/julianborger ; www.warhistoryonline.com/war-articles/popular-pharmaceutical-company-bayer-bought-concentration-camp-victims-wwii.html ; www.gmwatch.org/en/gm-firms/11153-bayer-a-history ;

www.nytimes.com/2003/11/19/nyregion/capping-the-cost-of-atrocity-survivor-of-nazi-experiments-says-8000-isn-t-enough.html ; ahrp.org/auschwitz60-year-anniversary-the-role-of-ig-farben-bayer/) and Gustav Wagner, an SS officer known as the "Beast" (www.history.com/news/how-south-america-became-a-nazi-haven ; www.dailymail.co.uk/news/article-2117093/Secret-files-reveal-9-000-Nazi-war-criminals-fled-South-America-WWII.html).

On a less sinister note, here is just one inspirational reforestation story from there - https://mymodernmet.com/sebastiao-salgado-forest/ .

Message for us is to eat organic food with less red meat, use less fuel to travel (pneumatically powered vehicles?) and also to insulate homes or use passive-solar and heat-pump regulators. All is in the tenets of Permaculture philosophy, practices and procedures (Mollison 1988).

Fervent arguments... Compost rather than burn...Permafrost soils are still poorly known... etc.

All is not lost with Rothamsted data as they have been tracking the soil and crop differences comparing no fertilizers, with chemical fertilizers and with organic fertilizers (farm-yard manure of FYM that, although inferior to proper compost is still useful for comparison). Yields have been sustained at equivalent or higher rates for the entire 175 years of trials. Moreover, their earthworms are also higher at rates approaching those of proper organic farms. These summaries were reviewed and published here - https://www.mdpi.com/2571-8789/2/2/33 .

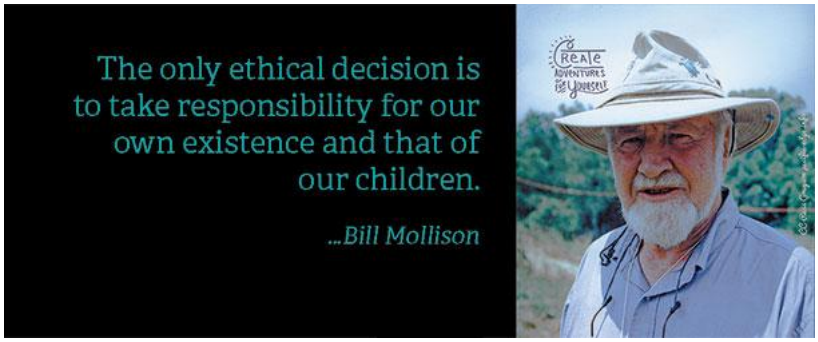
Interesting ignorance is in a supposed problem of glyphosate resistant "super-weeds" such as *Amaranthus palmeri* called pigweed (ref.). The narrow, mechanistic chemists' solution is to roll out yet more toxic chemicals tested in unrealistic glass houses using sterilized soil. The Permaculture approach is to realize that "the problem is the solution!". Rather obviously, as amaranth is deliberately cultivated in many places, it is an excellent traditional crop in its own right: www.bbg.org/news/weed_of_the_month_pigweed; www.eattheweeds.com/palmer-amaranth/. Why grow soy or corn to feed to pigs when you can easily grow an excess of organic pigweed and, as the name again suggests (ref.), you may find non-toxic varieties (ref.) are excellent and nutritious pig fodder too. Common sense is sometimes worth a try rather than continuing to bang your head against a wall, just sit & contemplate what it's all about.

It may even be soon realized that chemical ag has lied and that most insect species are either benign or help the crop by pollinating and predation on pest species; ditto weeds that do not compete for nutrients and water. When plants host predators, cover the bare ground to reduce evaporation and form mycorrhizal and bacterial symbioses to fix atmospheric nitrogen to mineralize soil nutrients they are actually contributing to the fertility and healthy biodiversity of the soil. Plants and animals have complex life cycles but always they die and return their nutrient stores to the earth. Their complexity is epitomized by the dynamic and highly complex parasitic compromises that have evolved to balance loss and gain. Often such interactions are underground and out-of-sight of all but astute soil Ecologists. Chemists can have no understanding of such complex biological interactions and dependencies: Concerning

Nature and agriculture they are mostly not qualified nor sufficiently informed to make any comments. In Asia, when a building is completed there is always a section left unfinished: The superstition is that if it is too perfect it will be destroyed by the gods out of jealousy. With Nature we too must be content with less that 100% exploitation and must pay Nature's taxes.

In 2018, IPCC said: "Limiting global warming to 1.5ºC would require rapid, far- reaching and unprecedented changes in all aspects of society..." The report finds that limiting global warming to 1.5°C would require "rapid and far-reaching" transitions in land, energy, industry, buildings, transport, and cities. Global net human-caused emissions of carbon dioxide (CO_2) would need to fall by about 45 percent from 2010 levels by 2030, reaching 'net zero' around 2050. This means that any remaining emissions would need to be balanced by removing CO_2 from the air."

My study provides just such a mechanism to balance emissions and to drawdown excess CO_2 using organic farming and Permaculture. Permaculture alone could solve all the issues that UN is concerned about as it is based upon respect and care for people and care for nature with an obligation to return any excess yields towards helping these two core principles (or as Bill said "*reinvestment in those ends*").



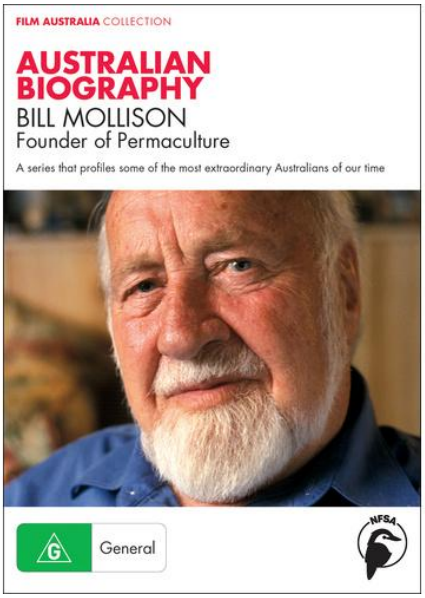


Image: http://shop.nfsa.gov.au/australian-biography-bill-mollison.

Refs.

Batjes (2018 https://onlinelibrary.wiley.com/doi/full/10.1002/ldr.3209) unfortunately he has missed my 2018 revised global data (although I have sent him copies of my papers)...

Lal, R. (2019). Conceptual basis of managing soil carbon: Inspired by nature and driven by science. *Journal of Soil and Water Conservation*. 74(2): 2 29A-34A. doi: 10.2489/jswc.74.2.29A; online - http://www.jswconline.org/content/74/2/29A.full.pdf+html.

Professor Rattan Lal is the premier soil carbon authority and recently (Spring 2019) won the Japan Prize for Science. In the above paper he acknowledges the SOC totals from my paper and says: "*Recalibration of the nonflat earth for terrain and topsoil may increase the estimates of soil C stock to 8,580 Pg C (8,778.2 × 109 tn C) (Blakemore 2018). With such a large C pool, in comparison with that of the atmosphere (820 Pg [838.9 × 109 tn]) and the biotic pool (620 Pg [634.3 × 109 tn]), a small emission from the soil C pool can easily overwhelm the atmospheric pool and aggravate the process of global warming. On the contrary, even a small increase in the soil C pool through storage of biomass C can have a strong drawdown impact on atmospheric concentration of CO2 . Thus, thoroughly understanding and judiciously managing the largest terrestrial C pool (Scharlemann et al. 2014) is of a critical importance to limiting global warming to 1.5°C (2.7ºF) and also meeting other demands of the growing and increasingly affluent world population*.".

Horton (2015) https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736%2815%2960696-1.pdf.

IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp. (www.ipcc.ch/report/ar5/wg1/; www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_all_final.pdf).

IBPES 2019 report draft is scheduled for May. I suspect they too will have yet more promotional bias of ocean & marine sciences and will mostly ignore topsoil, humus & soil organism food-webs based upon the activities of earthworms (along with microbes and fungi). Consequently they will be yet another toothless tiger and will make no significant changes.

A truly insightful person thinks hard to make honest comments (e.g. Greta Thunberg).

Just in case you didn't realize it yet, the sub-plot is that fossil fuels are not helping global warming and species decline... But the real culprit is chemical companies selling agrichemical poisons *and* pharmaceutical cures... Yet even they are not to blame. No, the blame rests with us all. Ignorant meat eaters, indifferent trendies, arrogant academics.... you can make your own list. If you listen to their lies and buy their junk food then get ill so must unquestionably take their junk medicine: You have bought a lie and will be shocked to suddenly wake up with cancer or autism or to Silent Spring. Just tonight I checked and the swallows that normally nest in my part of town have not nested. Our greed has killed them. Some fat cat in London or N.Y.